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This document is intended to provide a more complete discussion of the air quality portion of the summary Draft Environmental Impact Statement (DEIS) on the M-X Missile System. The report is organized with a presentation first of the existing and future (without the M-X) affected environment followed by a discussion of the M-X air quality related impacts.

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ENVIRONMENTAL CHARACTERISTICS OF ALTERNATIVE DESIGNATED DEPLOYMENT AREAS: ATMOSPHERIC RESOURCES

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15 December 1980

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1.0 INTRODUCTION

DESCRIPTION OF THIS DOCUMENT

This document is intended to provide a more complete discussion of the air quality portion of the summary Draft Environmental Impact Statement (DEIS) on the M-X Missile System. The report is organized with a presentation first of the existing and future (without the M-X) affected environment followed by a discussion of the M-X air quality related impacts.

Section 2.1, Existing Environment, discusses air quality and emissions data, visibility observations, and air pollution meteorology and climatology. To realistically evaluate the potential M-X induced air quality impacts, the future air quality of the study area (when the M-X system is proposed to be built) must be addressed and is presented next. Proposed sources that may degrade the air quality or will compete for available air resources (such as nonattainment area offsets) are issues addressed in Section 2.2, Future Environment without M-X.

The air quality models are described in Section 3 in order to acquaint the reader with the characteristics and rationale for selection of each model. The type of emissions and meteorological data that each model requires as input is briefly described as well as the limitations and assumptions inherent in each model. In order to predict impacts, estimates of M-X related air pollutant emissions are made (Section 4.1). The formulas used to calculate emissions are given along with the emission estimates.

Meteorological data requirements used for each model calculation are given in Section 4.2. Although very sparse meteorological data are available for the study area, the derivation of pollution dispersion conditions from nearby data sources are described.

Model results are given in Section 5. The results for the simpler Guassian dispersion, EPA-approved models (PAL and HIWAY) are presented first followed by the more complex three-dimensional wind flow IMPACT modeling results. Results using the EPA-approved ISC model are presented last. This model was not available in time for its results to be incorporated into the Draft EIS summary document. However, the modeling results are presented here as more realistic predictions of particulate concentrations than the PAL model provides. The regionally modeled concentrations, also called surface plots, are presented for each hour modeled. An analysis of the modeling results, with graphs, figures, and tables that illustrate the results, is more detailed than that presented in the summary document. Results are also discussed in light of the limitations of the models.

Most air quality models in current use were developed in response to specific regulatory needs, such as those mandated by the Clean Air Act (CAA). The CAA and its amendments provide a framework of air quality-related regulations within which one can evaluate the predicted M-X air quality impacts.

PURPOSE OF THE AIR QUALITY STUDY: REGULATORY FRAMEWORK

Extreme levels of air pollution have been found to cause human illness and even death. In addition, certain air pollution levels, while not primarily injurious to

human health, are damaging to the public welfare in terms of forest and crop damage, material and building corrosion, and damage to personal property.

In order to reduce air pollution, Congress passed the Clean Air Act of 1963 (CAA) with many subsequent revisions, including the Air Quality Act of 1967, and the CAA Amendments of 1970 and 1977. The U.S. Environmental Protection Agency (EPA) is designated to enforce the CAA by providing regulatory guidelines and helping the states to attain or maintain air quality standards.

National Ambient Air Quality Standards (NAAQS) were established by EPA for "criteria" pollutants; that is, for pollutants which were determined to be injurious to human health or welfare. "Primary" NAAQS were established to protect public health while "secondary" standards were established to protect public welfare.

Under the Clean Air Act each state is required to prepare a State Implementation Plan (SIP) that contains proposed methods of attaining the NAAQS where nonattainment presently exists, and to maintain the NAAQS where air quality levels are better than the NAAQS. An area where air quality is better than a NAAQS for a particular pollutant is referred to as an "attainment" area for that pollutant. An area with violations of the NAAQS is called a "nonattainment" area for each pollutant in violation of the standard. An area can be considered an "attainment" area for certain pollutants and a "nonattainment" area for other pollutants.

NONATTAINMENT AREAS

The 1977 Amendments required that certain revisions to SIPs be made. Control strategies were required for each state outlining a plan for attaining the NAAQS by a specified date for any areas that had not attained the NAAQS by 1977.

The control strategy must include a plan for the siting of new sources in nonattainment areas to insure that the resulting air quality will improve rather than worsen.

ATTAINMENT AREAS: PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

Attainment areas are classified as Class I, II, or III, and are subject to regulations designed to prevent the potential deterioration of air quality. Concentration significance levels, or increments, that cannot be exceeded were established for sulfur dioxide (SO_2) and total suspended particulates (TSP) that vary for Class I, II, and III areas. Increments are smallest and most restrictive for Class I areas, less restrictive for Class II areas, and least restrictive for Class III areas (see Table 1-1).

Areas where ambient air quality levels are well below the NAAQS and visibility is considered essential to the intrinsic value of the area are officially designated as Class I. Mandatory Class I status was assigned by Congress to all international parks, national wilderness areas and memorial parks larger than 5,000 acres (2,000 ha), and national parks larger than 6,000 acres (2,400 ha). These mandatory Class I areas cannot be redesignated. Class III status is assigned to major industrialized areas that have ambient SO_2 and TSP levels close to but below NAAQS. All remaining attainment areas are designated Class II.

Table 1-1. Maximum allowable air quality increases for SO_2 and TSP for significant deterioration under Clean Air Act Amendments of 1977.[1]

POLLUTANT	AVERAGING TIME	MAXIMUM ALLOWABLE CONCENTRATION INCREASES ($\mu g/m^3$)		
		CLASS I	CLASS II	CLASS III
Sulfur Dioxide (SO_2)	Annual Mean	2	20	40
	24-hour[2]	5	91	182
	3-hour[2]	25	512	700
Total Suspended Particulates (TSP)	Annual Mean	5	19	37
	24-hour[2]	10	37	75

730

[1]All attainment areas in the Nevada/Utah and Texas/New Mexico study areas are designated Class II except Mandatory Class I areas.

[2]The 3-hour and 24-hour SO_2 and TSP concentrations can not be violated more than once per year.

The reclassification of certain Class II areas to Class I status is under review. Mandatory and proposed Class I areas in the M-X deployment area are discussed in Section 2.1.

PSD increments, or similar regulations, for hydrocarbons, carbon monoxide, nitrogen oxides, and photochemical oxidants are currently being considered. Regulations protecting visibility in Class I areas were signed by the EPA Administrator on November 21, 1980. When implemented, these regulations will affect development in PSD areas or in areas close to PSD areas where it is shown that the air or visibility in a PSD area will be affected.

REGULATED SOURCES UNDER PSD REGULATIONS

PSD preconstruction review is required for all new or modified major stationary sources in attainment areas. A major stationary source refers to any of 28 specified stationary sources which emit, or have the potential to emit, 100 tons per year or more of any criteria air pollutant or all other stationary sources which emit, or have the potential to emit, 250 tons per year of any criteria air pollutant.

PSD preconstruction PSD review procedures include (1) a case-by-case determination of the Best Available (air pollution) Control Technology (BACT) to be applied, (2) submission of required monitoring data, (3) a modeling study and discussion of the impacts of the proposed source on ambient air quality levels, (4) an assessment of the effects on visibility, soils, and vegetation, and (5) full public review.

REGULATED SOURCES UNDER NONATTAINMENT REGULATIONS

The control strategy for nonattainment areas must include a preconstruction permit review for all major stationary sources, a vehicle emission control inspection and maintenance program in carbon monoxide or photochemical oxidants nonattainment areas, and any other measure necessary to provide for attainment of the NAAQS. Other measures can include indirect source review, however, EPA does not require states to include indirect source review in their control strategies.

An "indirect source" is a facility, building, structure, or installation which attracts (or may attract) mobile service activity that results in emissions of a pollutant for which there is a NAAQS. Examples include highways and roads, and retail, commercial, and industrial facilities.

M-X RELATED AIR QUALITY PROBLEMS

M-X related air pollutant effects will result primarily from area emission sources such as fugitive dust from construction activity and from gaseous emissions during the operations phase from indirect sources associated with the operation base. Historically, the emphasis in federal and state air pollution regulations has been on controlling emissions and mitigating air quality impacts from major stationary, point emission sources rather than area sources, indirect sources, or temporary sources, particularly with regard to PSD regulations in attainment areas. Consequently, modeling techniques that predict air quality impacts have been developed principally for major stationary emission sources.

CONSTRUCTION

A primary air quality impact result from M-X system construction will be the fugitive dust emissions from construction activities such as earthmoving, sand and gravel processing, aggregate storage area operations, and the movement of trucks and other vehicles over unpaved surfaces. Fugitive dust emissions increase particulate loadings in the atmosphere surrounding construction. The size distribution of the particles emitted and prevailing atmospheric conditions determine the transport distances of dust from the construction site. Fugitive dust emissions affect the construction workers on site, visitors to the area, and any nearby residents.

Increased particle deposition on surfaces downwind will occur from M-X fugitive dust emissions. The impact from dust will depend on the sensitivity of the area to deposition. For example, some biological or ecological communities will be more susceptible to damage from particle deposition than others. Also, nearby residences will experience particle deposition impacts varying from mild inconvenience, such as increased dust on windows, to major effects such as siltation of ponds. The degree of impact depends on the construction activity rate, local atmospheric conditions and distance from the site.

Particle content in the atmosphere affects the local visibility. Long range transport of dust particles can cause visibility impacts from the construction site. Smaller particles are more highly correlated with visibility impairment so that the impact on visibility will depend largely on the size distribution of the dust emissions. PSD regulations require that visibility impairment in Class I areas caused by any permanent* major stationary source must be evaluated prior to project approval. The M-X system does not include the installation of any permanent major stationary sources. However, M-X construction emission sources may cause visibility impairment at those Class I areas less than 40 mi from the deployment area. Evaluation of visibility impairment from elevated point sources is the principle focus of current research directed by EPA. Predicting visibility impairment from area-wide, ground-level sources is much more difficult and less well understood. Visibility effects from fugitive dust emissions are addressed here but are not quanitified, pending further site-specific investigations.

Other impacts are possible from construction activities of the M-X system, since gaseous emissions will result from construction vehicles and the generators used to provide power for material processing activities. Gaseous NO_x emissions from all generators associated with shelter and cluster construction will be large: 269 tons per year (NO_x), 58 tons per year (CO), 21 tons per year (HC), 19 tons per year (TSP), and 18 tons per year (SO_x). These emissions will cause local pollutant levels to be elevated.

Gaseous emissions from construction vehicles will cause increases in ambient gaseous levels to occur near roadways. The impacts from these emissions will depend on the degree of exposure.

*Temporary emissions include (but are not limited to) emissions from a portable facility, construction, or exploration facilities lasting less than two years at one site (45 FR 52719, August 7, 1980).

Other elements that may be released from the ground-level emissions of construction activity include surface deposits of substances, such as zeolite, an alleged carcinogen. Zeolite occurs in the Great Basin area in many geological formations. Construction activity may disturb zeolite deposits by soil removal or other construction activity, causing zeolites to be airborne in fugitive dust emissions. The potential zeolite hazard to human health due to M-X construction activities is being studied.*

Alleged or known carcinogenic substances are regulated under the National Emission Standards for Hazardous Air Pollutants (NESHAPS). Under this rule, emission standards have been established for asbestos, vinyl chloride, beryllium, and mercury. Zeolites appear to be similar to asbestos in their health effects, but no standards are presently in effect.

OPERATION

Air pollutant emissions during operation of the M-X system occur at the operating base and to a smaller degree in the deployment area. Operating base emissions include gaseous and particulate emissions from vehicles and gaseous emissions from space heating and cooling. Other emissions sources will include small industrial sources and possibly a local power plant. CO and NO_x emissions will be emitted at the operating base, primarily from vehicles and space heating and cooling. These CO and NO_x emissions will cause elevated pollutant levels in local emission hot spots, such as adjacent to congested or busy roadways. HC will be emitted from vehicles, aircraft, and fuel storage areas. The NAAQS for HC was established as a guideline for attaining the O_x standard. An O_x problem as a result of the M-X system is not expected because HC and NO_x emissions, the precursors to photochemical activity, are not expected to be emitted in sufficient quantities to create a photochemical oxidant problem.

Emissions in the deployment area during operation, outside of the operating base, will include fugitive dust from surfaces left exposed after construction and from occasional vehicular traffic over the unpaved cluster roads. These increased fugitive dust emissions from the M-X system will add to background particulate levels to an undetermined degree and may cause local visibility problems during high wind or active traffic periods.

*Refer to the Geological Resources Technical Report for detailed information on zeolites, their occurence in the study area and alleged health hazard.

2.0 ATMOSPHERIC RESOURCES

2.1 EXISTING ENVIRONMENT

NEVADA/UTAH (2.1.1)

The Nevada/Utah basing area is primarily a plateau area on which there are numerous mountain ranges and a well-defined ridge and valley system. The region contains desert or semidesert lands owing to its location just east and leeward of the Sierra Nevada Range. Moist air associated with Pacific Ocean storms ascends the western slopes of the Sierras where a large part of the moisture falls as precipitation. As the air descends the eastern slope, it is warmed by compression, resulting in little or no precipitation. Because of the large variation in elevation between mountains and valleys there are large local variations of temperature and rainfall. In general the most significant climatic features of the region are considerable sunshine, small annual precipitation in the valleys, heavy snowfall in the higher mountains, low relative humidity, and extreme daily ranges of temperature.

Temperature

Temperatures in the Nevada/Utah basing region are highly variable both seasonally and diurnally. Normal daily maximum temperatures range from the 30s and 40s (degrees F) in January to the 80s and 90s in July. Minimum temperatures tend to range between 10 to 20 degrees F in January to the 40s and 50s in July. The mean daily temperature range is large, especially in the summer when it is 25 to 40 degrees F. The temperature ranges are especially large in the valleys because of cold air drainage from the mountains at night. The minimum temperature at a valley floor is generally 5 to 10 degrees F lower than at higher elevations and can be as much as 30 degrees F lower.

Precipitation

The Nevada/Utah area has in general low annual average precipitation levels, and a widely varying precipitation pattern. Precipitation amounts depend very much on elevation. Higher elevations tend to receive more precipitation than do the lower elevations. Figure 2.1.1-1 shows the annual average precipitation pattern for the Nevada/Utah region based primarily on weather stations located at lower altitudes. Precipitation amounts are distributed relatively uniformly throughout the year. The records at Ely, Nevada, show a slight maximum during the spring while Caliente, Nevada, has a summer maximum. The recording weather stations in Utah indicate a tendency towards a spring precipitation maximum.

Wind Speeds and Mixing Heights

In general, the dispersive ability of the atmosphere in the Nevada/Utah basing area is good. The seasonal and annual averaged morning and afternoon mixing heights and wind speeds appear in Table 2.1.1-1. Afternoon mixing heights are large particularly during the spring through autumn seasons, and wind speeds are relatively brisk. Morning mixing heights are low in the Nevada/Utah region. This is a result of nocturnal radiation inversions and frequent cold air drainage into the valleys producing surface-based temperature inversions. These inversions break up a

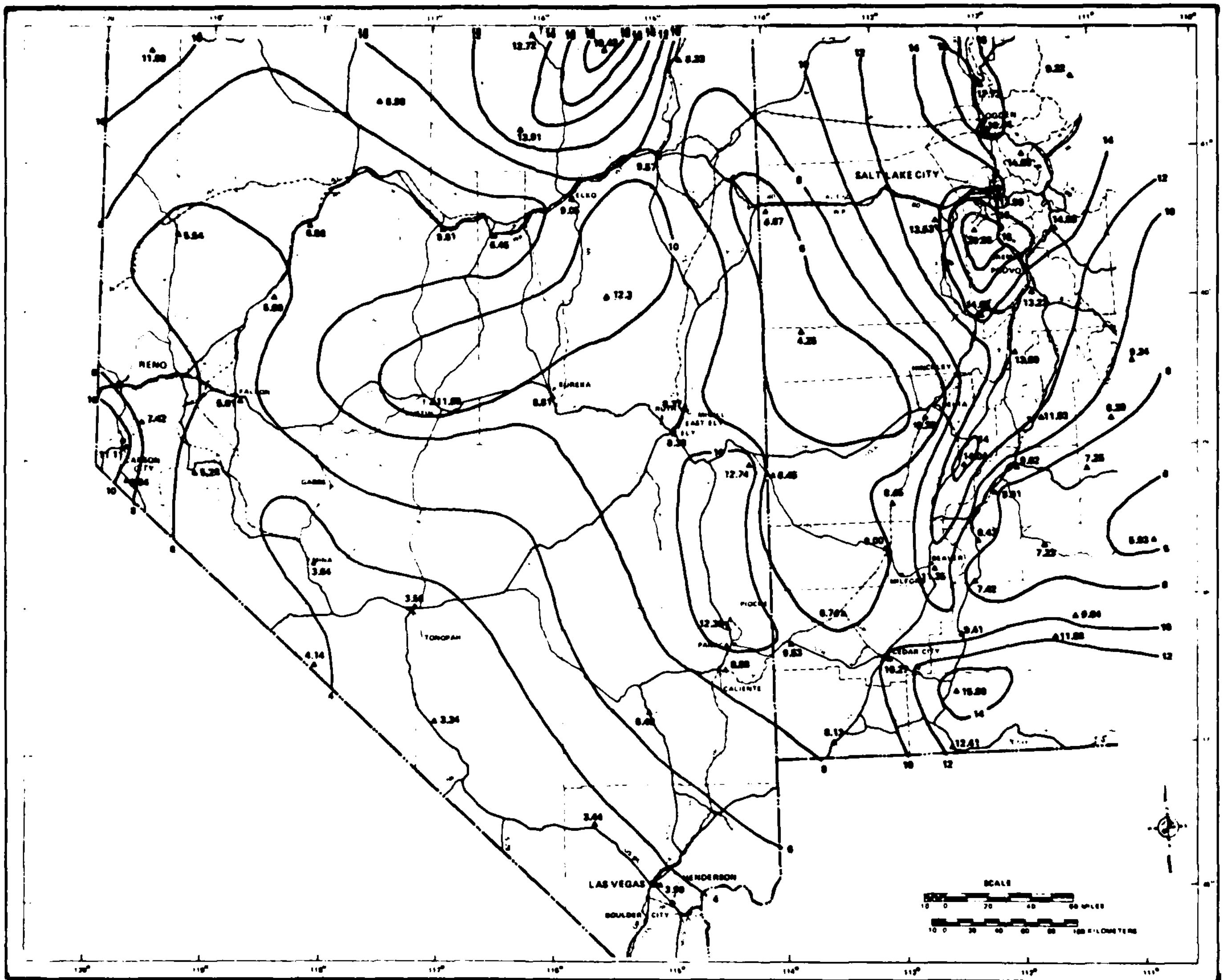

Figure 2.1.1-1. Mean annual precipitation for Nevada/Utah, in inches.

Table 2.1.1-1. Mixing heights and wind speeds for stations in Nevada/Utah.

STATION	TIME	WINTER HT[1]	WINTER U[2]	SPRING HT	SPRING U	SUMMER HT	SUMMER U	AUTUMN HT	AUTUMN U	ANNUAL HT	ANNUAL U
Ely, NV.	Morning	193	5.1	489	5.1	109	4.2	161	4.5	238	4.7
	Afternoon	1072	5.5	2708	7.4	3624	7.0	2179	6.1	2396	6.5
Las Vegas, NV.	Morning	321	4.5	433	5.6	292	4.7	276	4.3	331	4.8
	Afternoon	1153	4.2	2785	7.1	3693	6.7	2106	5.2	2434	5.8
Winnemucca, NV.	Morning	301	3.3	434	4.1	129	2.7	255	3.4	280	3.4
	Afternoon	1067	4.9	2756	6.8	3656	6.2	2150	5.4	2407	5.8
Salt Lake City, UT.	Morning	329	4.3	419	5.4	216	4.6	238	4.6	300	4.7
	Afternoon	944	4.6	2675	6.6	3737	6.2	1933	5.5	2322	5.7

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[1]Mixing height given in meters.

[2]Wind speeds are averaged through the mixed layer and are in units of meters per second.

few hours after sunrise as surface heating by the sun causes vertical mixing in the atmosphere.

The prevailing surface wind direction in the Nevada/Utah region is from the south to southwest. However, it is the mountain and valley topography that most strongly influences local wind speed and direction. Because of the north-south orientation of the mountain ranges the surface winds in the valleys tend to be predominantly from the north or south. This pattern can be modified at night by downslope winds produced by cool, dense air flowing from higher elevation towards the valley floor. In the morning, east-facing mountain slopes heat up because of their orientation to the sun and induce upslope winds. This upslope wind is generally dominated by winds blowing up and down the valley as the day progresses and the whole valley is heated.

Stability

Atmospheric stability varies considerably both seasonally and diurnally in the basing region. The frequency of stability categories is summarized in Table 2.1.1-2. The frequent occurrence of stable conditions in Nevada/Utah is due to cold air drainage into the valleys as well as the extreme amount of nocturnal radiational cooling.

Dust Storms

Due to arid climate, dry soils, and occasional strong winds in the basing region, dust can be mixed high into the atmosphere. At times, concentrations of this natural windblown dust can be of a sufficient magnitude to severely restrict visibility. Table 2.1.1-3 contains data on the frequency of dust observations for the basing region. The area most frequently experiences dust in the months of March and April. This is primarily due to the fact that maximum wind speeds for the year occur during these months.

Baseline Particulates

Particulates are designated by the Federal Environmental Protection Agency as one of the "criteria" pollutants. Criteria pollutants are those which could be factors in affecting human health. For this reason, criteria pollutants are carefully monitored and have ambient air quality standards which legally cannot be exceeded. Particulates are defined as any solid or liquid particles dispersed in the air. This does not include water vapor or water droplets, but does include dust, pollen, ash, soot, metal particles, or chemical droplets. Collectively, this group is known as "total suspended particulates" (TSP).

Particulates may originate from one of two sources: natural or anthropogenic. Natural sources include forest fires, volcanoes, sandstorms, and windblown dust. Windblown dust from erosion of the soil surface will be of primary concern when considering particulate emissions in the M-X deployment areas. Other natural sources by their very nature only occur on an intermittent basis, although they are considered as a steady-state effect in determining baseline conditions.

The anthropogenic sources of particulates are related to transportation (land vehicles, aircraft and water vessels); fuel combustion (residential, electric

Table 2.1.1-2. Average range of frequency of stability conditions in Nevada.

SEASON	PERCENT FREQUENCY OF STABILITY CONDITIONS		
	NEVADA		
	STABLE	NEUTRAL	UNSTABLE
Winter	30-40	45-55	5-15
Spring	25-35	40-50	15-25
Summer	30-40	30-40	25-35
Autumn	40-50	30-40	20-30
Annual	30-40	35-45	20-30

831-1

Table 2.1.1-3. Monthly percent frequency of dust observation in the Nevada/Utah region.

STATION	PERCENTAGE OF HOURLY WEATHER OBSERVATIONS WITH RECORDED DUST OBSERVATIONS												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	ANNUAL
Nevada/Utah													
Elko, NV	0.055	0	0.055	0.229	0.174	0.016	0.320	0	0.025	0.103	0	0.034	0.061
Ely, NV	0.036	0.038	0.053	0.254	0.018	0.018	0.530	0	0.019	0.055	0.19	0.081	0.054
Wendover, UT	0.044	0.072	0.102	0.022	0.142	0.023	0	0.033	0.022	0.052	0	0	0.041
Dugway, UT	0.100	0.300	0.800	0.700	0.700	0.300	0.100	0.100	0.200	0.100	0.100	0.038	[illegible]
Milford, UT	0.054	0.184	0.488	0.656	0.502	0.183	0	0	0.030	0.144	0	0.101	[illegible]

generation, industrial and commercial-institutional); industrial processing (chemical, food, metals, minerals, petroleum, wood, leather, textiles and others); solid waste disposal; agricultural tilling; construction activity; and dust from streets and unpaved roads. The various anthropogenic sources may be further categorized with respect to one of two possible types of origin - point or area source. A point source is defined as an emission source which is stationary such as structure, building, or facility. Area sources are all emission sources not identified as point-sources. For example, all mobile sources such as motor vehicles and aircraft, small stationary retail gasoline marketing are considered area sources. Generally, total emission levels for specific categories of area sources have to be estimated. These estimates may be made using an appropriate emission factor and activity level as outlined in EPA publication No. AP-42 "Compilation of Air Pollutant Emission Factors," revised May 1978 (thereafter referred to as AP-42). An emission factor is a statistical average of the rate at which a pollutant is released to the atmosphere, divided by the level of the producing activity. Because the emission factor is a statistical average, its use may not be appropriate for establishing the baseline particulate concentrations or the amount of expected new emissions in the M-X deployment areas. These values will be better established by the acquisition of pre-construction and construction site-specific monitoring data. The emission factors may be used, however, to provide useful estimates of background levels and to describe the general magnitude of M-X-related emissions. In this manner, preliminary judgments of impact may be made prior to the complete analysis of actual onsite data. Further, an extensive air quality monitoring network will provide valuable information relating to the exact nature of the particulate emissions, the atmospheric conditions, and the resulting effect on air quality, caused by deployment of the M-X system.

Sources (Emissions)

In order to effectively assess the impact of particulate emissions created by the M-X project, it is necessary to first establish a background baseline particulate level for each deployment area in question. The background level for each hydrographic sub-basin in the Nevada deployment area can be established by use of the data in Table 2.1.1-4. This table is the most recent data available from the state of Nevada and represents values which have been either directly measured, or estimated using techniques appropriate to conditions for Nevada. Included in the table are measures of stationary, mobile, and fugitive dust sources in tons/year. The stationary sources include particulate emissions from residential, commercial and industrial fuel combustion; industrial processing; and general burning. Mobile sources are rail, air, auto, and off-highway vehicles. The fugitive dust category comprises sources of dust released from construction activity, from normal streets, unpaved roads, sand/gravel roads, and agricultural activity. Natural windblown fugitive sources are included as a separate heading in the fugitive dust category. It is interesting to note that with the exception of three basins (No. 138, No. 140B, and No. 203), the natural fugitive sources contribute a higher percentage of fugitive dust release than all the other fugitive dust sources combined. The amount of natural fugitive dust is greater than all other dust sources by a factor of 1.4 (basin No. 56) to 15,000 (basin No. 217).

Table 2.1.1-4. Baseline particulate emission levels in Nevada (page 1 of 2).

HYDRO-GRAPHIC SUB-BASIN	STATIONARY SOURCES (TONS/YR)	MOBILE SOURCES (TONS/YR)	FUGITIVE DUST SOURCES (TONS/YR)		TOTAL* (TONS/YR)	TOTAL (TONS/YR)	AREA (MI)^2	DENSITY = TOTAL*/AREA (TONS/YR)	DENSITY = TOTAL/AREA (TONS/YR)
			NATURAL	OTHER					
47	.8	.9	2,634	1,358.3	1,360	3,994	787	1.73	5.07
53	.6	2.2	4,614	1,281.1	1,284	5,898	1,002	1.28	5.89
54	196.0	.3	3,790	727.5	924	4,714	752	1.23	6.27
55	69.1	.1	2,404	209.0	278	2,682	376	.74	7.13
56	2.9	3.7	3,425	2,363.7	2,370	5,795	1,138	2.08	5.09
57	.2	.0	3,276	171.9	172	3,448	452	.38	7.63
58	.1	.8	2,241	405.4	406	2,647	319	1.27	8.30
101	109.2	54.4	53,614	6,612.0	6,776	60,390	2,182	3.11	27.68
122	12,186.2	2.7	35,744	3,185.0	15,374	51,118	1,277	12.04	40.03
124	.0	.9	4,021	259.8	251	4,272	285	.88	14.99
125	.0	.0	625	54.5	55	680	43	1.28	15.81
126	.0	.4	1,453	34.0	34	1,487	110	.31	13.52
127	.1	.7	2,052	192.3	193	2,245	216	.89	10.39
128	.8	1.0	53,727	2,520.8	2,523	56,250	1,303	1.94	43.17
129	.4	.4	29,345	1,831.3	1,832	27,513	742	2.47	37.08
132	.0	.0	4,242	68.0	68	4,310	142	.48	30.35
133	.1	1.4	15,146	278.3	280	15,426	416	.67	37.08
134	.1	.6	2,275	72.5	73	2,348	582	.13	4.03
135	.1	.1	1,601	702.0	702	2,303	460	1.53	5.01
136	.0	.0	1,777	165.0	165	1,942	284	.58	6.84
137A	13.4	9.3	8,698	1,874.0	1,894	10,593	1,603	1.18	6.61
137B	1.0	5.3	9,913	2,574.6	2,580	12,494	1,323	1.95	9.44
138	.1	1.3	4,306	6,275.0	6,276	10,582	595	10.55	17.79
139	.0	2.1	6,129	721.4	724	6,853	868	.84	7.89
140A	.1	.1	2,996	447.7	448	3,444	529	.85	6.51
140B	.1	.5	2,483	3,464.0	3,465	5,948	509	6.81	11.68
141	.1	3.1	10,930	4,293.1	4,296	15,226	971	4.42	15.68
142	1.5	4.5	4,612	689.4	695	5,307	313	2.22	16.96
143	1.0	.6	6,895	1,263.3	1,265	8,160	555	2.28	14.70
144	.1	4.3	7,304	447.0	451	7,755	535	.84	14.50
145	.0	.0	71,024	16.7	17	71,041	381	.04	186.46
148	.0	.0	69,920	36.6	37	69,957	403	.09	173.59
149	.1	1.0	147,143	501.7	503	147,646	985	.51	149.89
150	.0	.0	32,659	141.5	142	32,800	434	.33	75.58
151	.1	.0	6,242	207.9	208	6,450	444	.47	14.53
152	.0	.0	189	16.2	16	205	17	.94	12.06
153	4.6	4.2	9,442	1,473.0	1,482	10,923	752	1.97	14.53
154	.2	2.0	13,827	1,138.6	1,141	14,968	801	1.42	18.69
155A	18.2	.7	9,199	786.1	805	10,003	591	1.36	16.93
155B	.0	.1	692	80.5	81	773	57	1.41	13.55
155C	.0	.4	6,440	251.3	252	6,692	510	.49	13.12
156	.2	.8	136,391	382.8	384	136,775	1,036	.37	132.02
158A	.0	.0	113,374	16.3	16	113,390	663	.02	171.03
169A	.0	.2	97,398	184.3	185	97,583	618	.30	157.90
170	.0	.2	114,373	449.8	450	114,823	700	.64	164.03
171	.0	.0	80,203	161.0	161	80,364	460	.35	174.70
172	.1	.0	69,497	221.7	222	69,719	493	.50	141.42
173A	.1	.3	95,627	226.6	227	95,954	603	.38	158.96
173B	1.1	1.8	268,565	2,708.6	2,716	271,277	2,149	1.26	126.23
174	.0	1.5	5,829	426.4	428	6,257	422	1.01	14.83
175	.0	.1	9,002	489.0	489	9,491	651	.75	14.58
176	1.4	1.4	5,437	3,187.6	3,190	8,627	1,004	3.18	8.59
178A	.1	.6	1,126	471.8	473	1,599	269	1.76	5.94
178B	.1	.3	12,770	1,877.9	1,878	14,648	739	2.54	19.82

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Table 2.1.1-4. Baseline particulate emission levels in Nevada (page 2 of 2).

HYDRO-GRAPHIC SUB-BASIN	STATIONARY SOURCES (TONS/YR)	MOBILE SOURCES (TONS/YR)	FUGITIVE DUST SOURCES (TONS/YR)		TOTAL* (TONS/YR)	TOTAL (TONS/YR)	AREA $(MI)^2$	DENSITY = TOTAL*/AREA (TONS/YR)	DENSITY = TOTAL/AREA (TONS/YR)
			NATURAL	OTHER					
179	19,074.2	26.2	43,758	9,807.3	28,908	72,666	1,942	14.88	37.42
180	.0	.0	3,999	200.3	200	4,199	362	.55	11.60
181	.0	1.4	8,613	2,989.3	2,991	11,604	882	3.39	13.16
182	.0	.7	4,505	416.1	417	4,922	383	1.09	12.85
183	.5	2.4	3,430	414.8	418	3,848	557	.75	6.91
184	1.0	3.4	33,306	2,136.9	2,142	35,448	1,661	1.29	21.34
185	.0	.1	11,748	469.2	469	12,217	345	1.36	35.41
186A	.0	.0	4,937	113.7	114	5,051	125	.91	40.41
186B	.0	.7	9,481	212.6	213	2,694	270	.79	35.90
187	.2	7.7	6,885	945.2	953	7,838	954	1.00	8.52
194	.0	.0	1,278	53.7	54	1,332	76	.72	17.76
196	.0	.0	3,224	253.3	253	3,477	413	.61	8.41
198	.1	.1	662	137.4	138	800	113	1.23	7.08
199	.0	.1	76	50.3	50	126	12	4.20	10.53
200	.3	.1	347	123.2	124	471	52	2.38	9.05
201	.0	.2	1,296	635.7	636	1,932	287	.43	6.73
202	3.9	3.6	2,772	441.8	449	3,221	418	1.07	7.71
203	387.3	4.2	2,068	2,664.2	3,056	5,124	334	9.15	15.34
204	2.3	.6	30,451	968.3	971	31,422	364	2.67	86.3[illegible]
205	4.4	2.2	166,581	2,603.8	2,610	169,919	979	2.67	172.82
206	.0	.0	25,037	70.4	70	25,107	234	.31	107.30
207	4.3	3.2	13,898	1,969.2	1,977	15,874	1,607	1.23	9.88
208	.0	.1	71,851	460.4	460	72,311	508	.91	142.35
209	2.9	5.1	122,499	969.1	977	123,476	768	1.27	160.78
210	.0	4.4	115,445	137.4	142	115,587	657	.22	175.93
216	.0	22.7	31,354	360.9	384	31,738	156	2.46	203.45
217	.0	.0	15,337	.0	1	15,337	80	.00	191.71
218	.8	16.5	61,180	5,092.4	5,110	66,290	318	16.07	208.46
219	.1	1.2	15,089	361.6	363	15,452	91	3.99	169.80
220	6.0	14.9	42,450	1,188.3	1,209	43,659	252	4.80	173.25
221	.0	.0	20,019	101.1	101	20,120	192	.53	104.79
222	3.4	17.8	146,105	952.3	973	147,078	907	1.07	162.16

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*Does not include Natural Fugitive Dust Sources.

The particulate emission data from Nevada is unique in that it is delineated by hydrographic sub-basin. This is ideal for purposes of impact assessment on a valley-to-valley basis because each sub-basin essentially encompasses one (sometimes two) valley regions. Assessment of a community or specific area within a valley would generally be based on the assumption of homogeneous conditions throughout a given valley, particularly for long-term type effects. Unfortunately, though, this level of data is not available for the M-X study region of Utah, where the analysis on a valley-to-valley basis would also be the most informative. Instead, we have available from Utah a 1976 emissions inventory which gives source category emissions by county. (See Table 2.1.1-5). Included as source categories are highway vehicles, off-highway vehicles, and other transportation (mobile sources); process industries, solid waste burning, space heating, and electric power generation (stationary sources); and dirt roads and forest fires (fugitive dust sources). Three categories of important fugitive dust sources which were found in the Nevada data are missing from the Utah data: construction activity, dust from agricultural activity, and natural windblown sources. It may be that construction and agricultural dust emissions within Utah are insignificant in relation to other emissions. These two activities need to be examined in order to determine if their emissions are a significant effect. The third category, windblown sources, has already been determined to be a major source in Nevada (see Table 2.1.1-4).

Visual assessment of background particulate levels may be made on a comparative basis between states from information contained in the 1977 National Air Quality, Monitoring and Emissions Trends Report. Data from this report are presented as TSP emission density maps for the Nevada/Utah area (see Figure 2.1.1-2). Note that the highest background particulate level to be found in the deployment areas of the states is less than 10 tons/mi^2. These levels do not, however, include particulate emissions from fugitive dust sources for either state.

Air Quality Levels

State and National Ambient Air Quality Standards (NAAQS) for particulates applicable in Nevada and Utah are shown in Table 2.1.1-6. Primary and secondary standards are the air quality levels necessary to protect the public's health and welfare respectively. The particulate standards are defined as Total Suspended Particulate (TSP) concentrations averaged for a 24-hour and annual period. States may implement standards that are more strict than the NAAQS. Nevada adopted a more strict primary TSP 24-hour standard that is equal to the National secondary 24-hour standard. Utah has not adopted other standards so only the NAAQS apply in Utah.

Areas that have attained the NAAQS are classified as attainment areas. Proposed sources in attainment areas must comply with Prevention of Significant Deterioration (PSD) regulations. Under PSD regulations, attainment areas are categorized as Class I, II, or III areas. TSP levels in Class I, II, and III areas are allowed to be degraded only by a specified increment. (see Table 1-1).

Mandatory Class I areas and those proposed for redesignation from Class II to Class I status, are shown in Figure 2.1.1-3. All other areas in attainment are designated Class II.

Areas that have air pollutant concentrations exceeding the NAAQS are classified as nonattainment areas for specific pollutants. An area can be designated

Table 2.1.1-5. Utah particulate emission inventory by county. (page 1 of 2).

REGION/COUNTY	STATIONARY SOURCES (TONS/YR)	MOBILE SOURCES (TONS/YR)	FUGITIVE DUST SOURCES (TONS/YR)	TOTAL (TONS/YR)
AQCR 14 FOUR CORNERS				
Emery	1,012	108	1,666	2,786
Garfield	323	501	1,773	2,597
Grand	646	111	1,720	2,477
Iron	566	196	3,038	3,800
Kane	67	49	1,138	1,254
San Juan	303	64	4,239	4,606
Washington	164	103	1,749	2,016
Wayne	247	14	1,799	2,060
AQCR 220 WASATCH FRONT				
Davis	570	625	394	1,589
Salt Lake	15,996	2,059	366	18,421
Tooele	4,994	230	2,310	7,534
Utah	8,088	630	1,672	10,390
Weber	2,074	616	284	2,974
AQCR 219 INTRA STATE				
Beaver	139	75	1,874	2,088
Box Elder	485	333	2,900	3,718
Cache	229	169	1,533	1,931
Carbon	3,728	104	1,034	4,866
Daggett	25	10	485	520
Duchesne	282	89	1,682	2,053
Juab	493	115	2,402	3,010
Millard	310	131	4,100	4,541

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Table 2.1.1-5. Utah particulate emission inventory by county. (page 2 of 2).

REGION/COUNTY	STATIONARY SOURCES (TONS/YR)	MOBILE SOURCES (TONS/YR)	FUGITIVE DUST SOURCES (TONS/YR)	TOTAL (TONS/YR)
AQCR 219 INTRA STATE (continued)				
Morgan	169	59	169	397
Piute	109	20	690	819
Rich	68	14	1,001	1,083
Sanpete	919	89	1,200	2,208
Sevier	1,131	127	1,263	2,521
Summit	329	150	308	787
Uintah	430	71	1,385	1,886
Wasatch	61	85	720	866

Source: State of Utah Emissions Inventory, 1976.

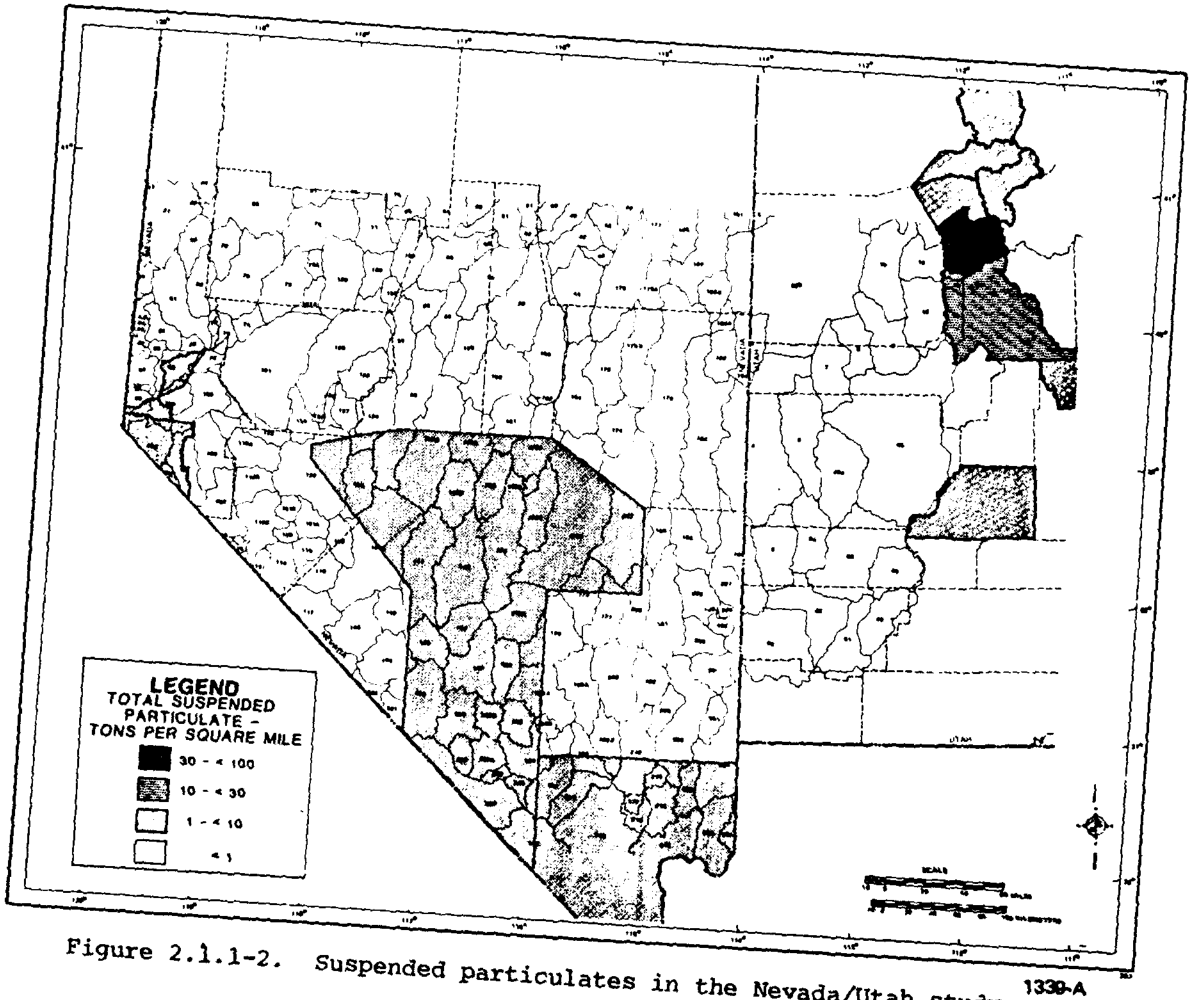

Figure 2.1.1-2. Suspended particulates in the Nevada/Utah study area.

Table 2.1.1-6. Summary of national ambient air quality standards (NAAQS) and Nevada/Utah ambient air quality standards for total suspended particulates (TSP) and lead (Pb).

POLLUTANT	AVERAGING TIME	NAAQS		NEVADA STANDARDS
		PRIMARY	SECONDARY	PRIMARY
Total Suspended Particulate Matter	Annual (Geometric Mean) 24-hour[3]	75 $\mu g/m^3$ 260 $\mu g/m^3$	60 $\mu g/m^3$[2] 150 $\mu g/m^3$	75 $\mu g/m^3$ 150 $\mu g/m^3$
Lead	Quarterly (Arithmetic Mean)	1.5 $\mu g/m^3$	Same as primary standard	Same as NAAQS

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[1]All Utah standards are equivalent to NAAQS.

[2]Secondary annual TSP standard (60 $\mu g/m^3$) is a guide for assessing State Implementation Plans.

[3]Not to be exceeded more than once per year.

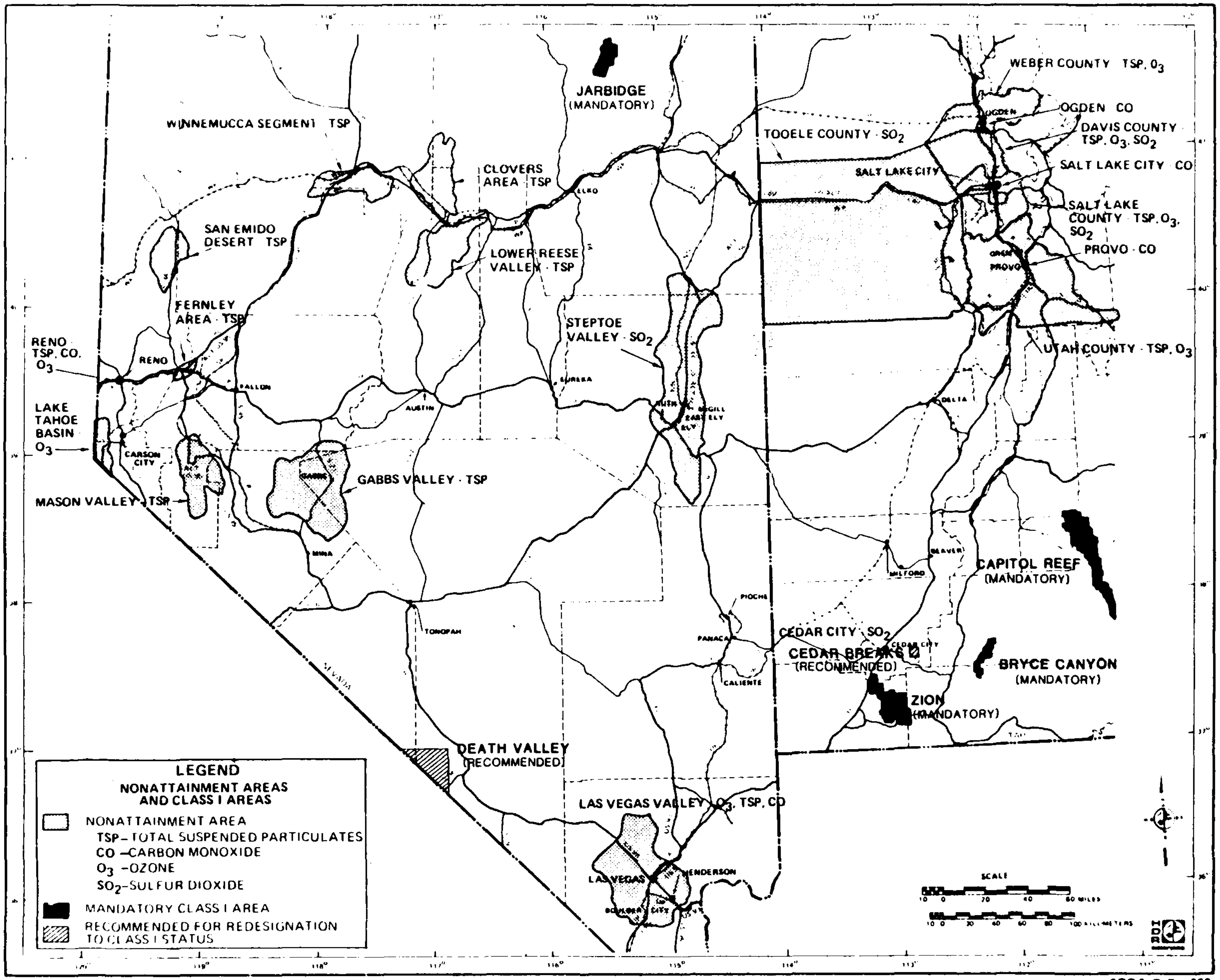

Figure 2.1.1-3. Class I areas and nonattainment areas in Nevada and Utah.

as attainment for one pollutant and nonattainment for another pollutant. New emission sources in nonattainment areas are required to comply with certain regulations designed to improve air quality in the area, such as obtaining emission offsets from existing emission sources. Nevada's nonattainment areas are designated by hydrographic basin, urban, or industrial area. Utah's nonattainment areas are designated by county, urban, or industrial area. TSP nonattainment areas in Nevada are Gabbs Valley, Lower Reese Valley, Winnemucca Segment Basin, Clovers Area, San Emido Desert, Fernley Area, Reno, Mason Valley, and Las Vegas Valley. TSP nonattainment areas in Utah are Weber County, Davis County, Salt Lake County, and Utah County. These are shown in Figure 2.1.1-3.

Annual and second highest 24-hour TSP levels in 1977 are given in Figure 2.1.1-4.

Background TSP levels are measured at several sites in the deployment area. These monitors are located in rural or remote areas and are not affected by anthropogenic TSP emission sources. A background monitor at Tonopah and Lehman Caves, Nevada, show TSP levels far below the annual or 24-hour NAAQS. Similar background levels can be assumed to occur in valleys of the deployment area without anthropogenic TSP emission sources.

TSP Seasonal Variation

Annual and quarterly TSP mean values for Lehman Caves, Nevada, are given in Table 2.1.1-7. Lehman Caves is considered a background monitor by the Nevada Department of Environmental Protection. Little annual variation has occurred during the four-year monitoring period (1974-1977). TSP quarterly variation does occur. Highest particulate levels occur during the drier summer months (July to September). Lowest particulate levels occur during the wetter winter and spring months (January to March). Other sites show maximum dust frequencies in March and April, see Table 2.1.1-3.

Baseline Gaseous Pollutants

Sources (Emissions)

Baseline gaseous pollutant levels are difficult to establish for each of the deployment areas within the states of Nevada and Utah. Although necessary to accurately assess the degree of emission impact created by the construction and deployment of the M-X system, few measurements exist.

The Utah gaseous pollutant emission data which are available are values of SO_x, CO, HC and NO_x on a county-by-county basis from the state of Utah. The data is compiled in the 1978 "Summary of Air Pollution Source Emission Calculations from Utah," which was prepared using 1976 data (see Tables 2.1.1-8 through 2.1.1-11). The source categories listed in the tables are:

- mobile sources - which include highway vehicles, off-highway vehicles, and other transportation
- stationary sources - which include process industries, solid waste burning, space heating, and electric power generation
- natural sources - which include forest fires

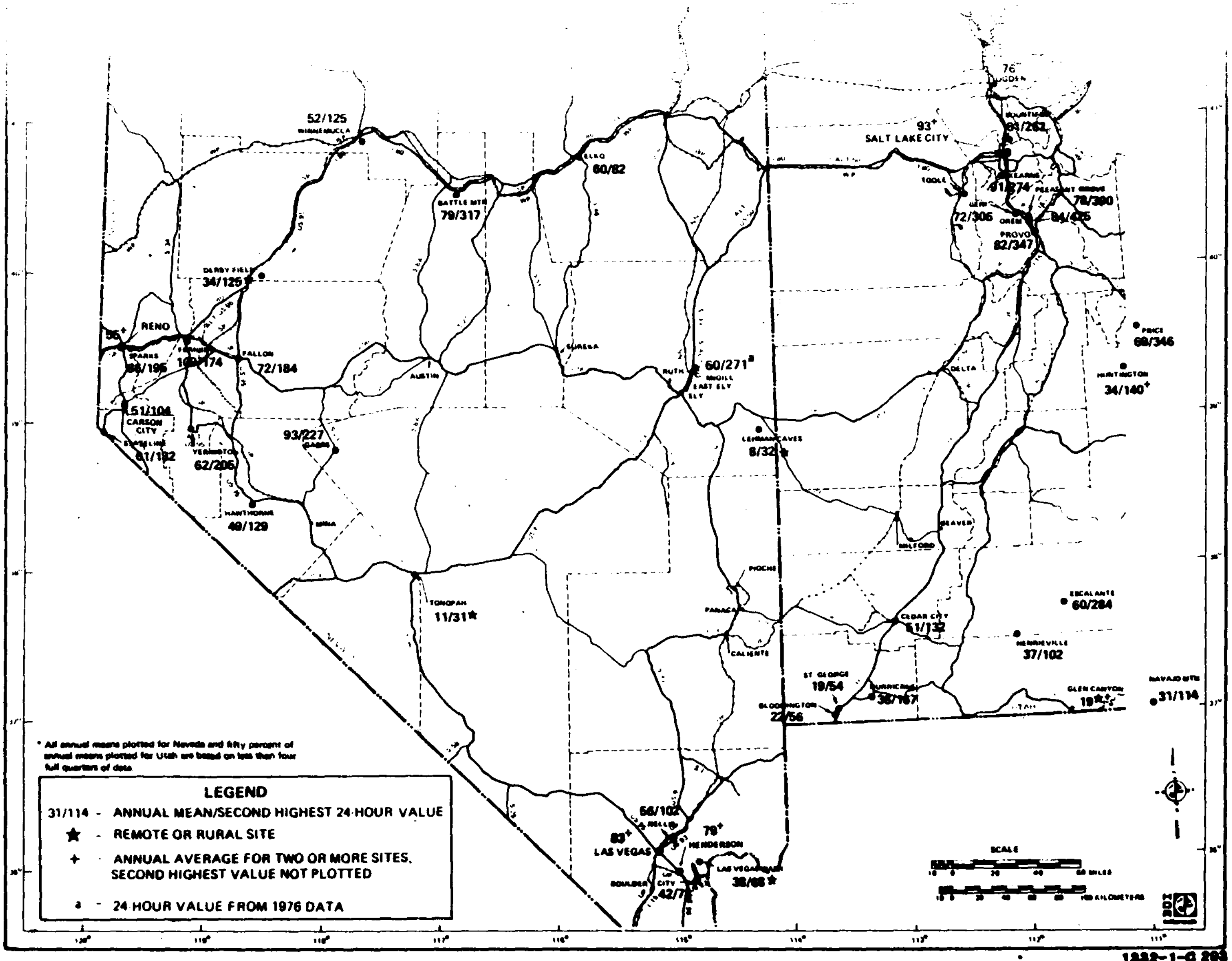

Figure 2.1.1-4. Total suspended particulate levels in Nevada and Utah (1977).

Table 2.1.1-7. Annual and quarterly total suspended particulate levels at Lehman Caves, Nevada, 1974-1977.

YEAR	ANNUAL	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER
		JANUARY-MARCH	APRIL-JUNE	JULY-SEPTEMBER	OCTOBER-DECEMBER
1974	6.3	3.9*	9.3	10.3	2.8
1975	8.4	4.4	11.2	12.6	8.8
1976	8.4	3.4	10.3	13.1	13.1*
1977	8.2	5.6	8.6	11.5	7.1
4-Year Average	7.8	4.3	9.9	11.9	8.0

729-1

* 50 percent or less of sampling days recorded.

Table 2.1.1-8. Utah SO_x emission inventory by county. (page 1 of 2)

REGION/COUNTY	STATIONARY SOURCES (TONS/YR)	MOBILE SOURCES (TONS/YR)	NATURAL SOURCES (TONS/YR)	TOTAL (TONS/YR)
AQCR 14 FOUR CORNERS				
Emery	7,992	123	0	8,115
Garfield	97	35	0	132
Grand	94	122	0	216
Iron	801	173	0	974
Kane	38	34	0	72
San Juan	88	49	0	137
Washington	150	76	0	226
Wayne	48	10	0	58
AQCR 220 WASATCH FRONT				
Davis	4,944	301	0	5,245
Salt Lake	18,610	1,505	0	20,115
Tooele	997	228	0	1,225
Utah	8,845	490	0	9,335
Weber	853	547	0	1,400
AQCR 219 INTRA STATE				
Beaver	71	87	0	158
Box Elder	782	295	0	1,077
Cache	628	157	0	785
Carbon	11,608	129	0	11,737
Daggett	16	8	0	24
Duchesne	137	67	0	204
Juab	153	119	0	272
Millard	162	132	0	294

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Table 2.1.1-8. Utah SO_x emission inventory by county. (page 2 of 2)

REGION/COUNTY	STATIONARY SOURCES (TONS/YR)	MOBILE SOURCES (TONS/YR)	NATURAL SOURCES (TONS/YR)	TOTAL (TONS/YR)
AQCR 219 INTRA STATE (continued)				
Morgan	1,200	78	0	1,278
Piute	38	14	0	52
Rich	32	11	0	43
Sanpete	342	107	0	449
Sevier	465	148	0	613
Summit	171	114	0	285
Uintah	187	55	0	242
Wasatch	56	66	0	122

1139

Table 2.1.1-9. Utah NO_x emission inventory by county. (page 1 of 2)

REGION/COUNTY	STATIONARY SOURCES (TONS/YR)	MOBILE SOURCES (TONS/YR)	NATURAL SOURCES (TONS/YR)	TOTAL (TONS/YR)
AQCR 14 FOUR CORNERS				
Emery	7,370	1,270	11	8,651
Garfield	75	475	11	561
Grand	42	1,296	81	1,419
Iron	98	1,718	20	1,836
Kane	18	502	26	546
San Juan	105	661	65	831
Washington	79	1,072	12	1,163
Wayne	26	139	2	167
AQCR 220 WASATCH FRONT				
Davis	2,030	6,437	9	8,476
Salt Lake	19,977	18,097	5	38,079
Tooele	1,308	2,579	48	3,935
Utah	13,169	5,407	11	18,587
Weber	486	5,510	9	6,005
AQCR 219 INTRA STATE				
Beaver	24	873	46	943
Box Elder	395	3,348	51	3,794
Cache	159	1,812	6	1,977
Carbon	10,522	1,250	48	11,820
Daggett	17	116	3	136
Duchesne	124	886	6	1,016
Juab	87	1,284	56	1,427
Millard	61	1,467	60	1,588

1140

Table 2.1.1-9. Utah NO_x emission inventory by county. (page 2 of 2)

REGION/COUNTY	STATIONARY SOURCES (TONS/YR)	MOBILE SOURCES (TONS/YR)	NATURAL SOURCES (TONS/YR)	TOTAL (TONS/YR)
AQCR 219 INTRA STATE (continued)				
Morgan	904	660	1	1,565
Piute	9	209	3	221
Rich	11	161	3	175
Sanpete	77	1,117	19	1,213
Sevier	296	1,461	7	1,764
Summit	252	1,586	22	1,860
Uintah	56	756	48	860
Wasatch	43	925	12	980

1140

Table 2.1.1-10. Utah HC emission inventory by county. (page 1 of 2)

REGION/COUNTY	STATIONARY SOURCES (TONS/YR)	MOBILE SOURCES (TONS/YR)	NATURAL SOURCES (TONS/YR)	TOTAL (TONS/YR)
AQCR 14 FOUR CORNERS				
Emery	250	2,006	65	2,321
Garfield	57	656	64	777
Grand	57	1,362	488	1,907
Iron	126	1,976	121	2,223
Kane	38	722	154	914
San Juan	276	1,004	391	1,671
Washington	102	1,586	70	1,758
Wayne	166	220	12	398
AQCR 220 WASATCH FRONT				
Davis	914	8,124	54	9,092
Salt Lake	5,009	31,817	28	36,854
Tooele	168	2,901	290	3,359
Utah	6,146	7,101	65	13,312
Weber	64	7,251	57	7,372
AQCR 219 INTRA STATE				
Beaver	46	865	275	1,186
Box Elder	156	4,044	304	4,504
Cache	110	2,446	36	2,592
Carbon	458	1,252	286	1,996
Daggett	6	157	18	181
Duchesne	106	1,862	38	2,006
Juab	82	1,420	339	1,841
Millard	1,670	85	359	2,114

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Table 2.1.1-10. Utah HC emission inventory by county. (page 2 of 2)

REGION/COUNTY	STATIONARY SOURCES (TONS/YR)	MOBILE SOURCES (TONS/YR)	NATURAL SOURCES (TONS/YR)	TOTAL (TONS/YR)
AQCR 219 INTRA STATE (continued				
Morgan	37	596	9	642
Piute	22	286	16	324
Rich	16	231	18	265
Sanpete	196	1,039	112	1,347
Sevier	206	1,531	39	1,776
Summit	700	1,800	131	2,631
Uintah	160	1,094	287	1,541
Wasatch	13	1,271	70	1,354

1141

Table 2.1.1-11. Utah CO emission inventory by county. (page 1 of 2)

REGION/COUNTY	STATIONARY SOURCES (TONS/YR)	MOBILE SOURCES (TONS/YR)	NATURAL SOURCES (TONS/YR)	TOTAL (TONS/YR)
AQCR 14 FOUR CORNERS				
Emery	829	6,540	379	7,748
Garfield	2,698	3,459	371	6,528
Grand	177	7,003	2,845	10,025
Iron	554	10,511	704	11,769
Kane	124	3,832	896	4,852
San Juan	1,349	5,007	2,283	8,639
Washington	338	8,710	410	9,458
Wayne	533	1,084	71	1,688
AQCR 220 WASATCH FRONT				
Davis	2,912	44,772	315	47,999
Salt Lake	17,101	187,761	165	205,027
Tooele	537	15,399	1,691	17,627
Utah	10,979	31,200	378	42,557
Weber	423	44,100	330	44,853
AQCR 219 INTRA STATE				
Beaver	174	4,362	1,603	6,139
Box Elder	523	21,246	1,771	23,540
Cache	478	13,270	213	13,961
Carbon	2,244	6,408	1,669	10,321
Daggett	23	843	105	971
Duchesne	328	6,489	220	7,037
Juab	338	7,390	1,975	9,703
Millard	338	8,617	2,094	11,049

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Table 2.1.1-11. Utah CO emission inventory by county. (page 2 of 2)

REGION/COUNTY	STATIONARY SOURCES (TONS/YR)	MOBILE SOURCES (TONS/YR)	NATURAL SOURCES (TONS/YR)	TOTAL (TONS/YR)
AQCR 219 INTRA STATE (continued)				
Morgan	144	2,957	50	3,151
Piute	115	1,585	91	1,791
Rich	68	1,264	106	1,438
Sanpete	853	5,313	651	6,817
Sevier	872	7,693	228	8,793
Summit	827	1,356	766	2,949
Uintah	611	5,576	1,674	7,861
Wasatch	52	6,881	410	7,343

1142

Comparison of SO_x emissions for the four counties potentially affected by the M-X system (Iron, Beaver, Juab, and Millard) and other counties in Utah demonstrates that both stationary and mobile emission sources are relatively low. Only Iron County with Cedar City SO_x pollution, which has recently been corrected, had substantial SO_x emissions in 1978. NO_x, CO, and HC emissions are primarily from mobile sources in the four counties with the exception of HC emissions in Millard County, which are primarily from stationary sources.

Gaseous pollutant emission data from the state of Nevada in the form of a point-source emission inventory performed on a sub-basin basis is presently being prepared.

As a preliminary evaluation of gaseous pollutant baseline levels in Nevada, data from the 1975 NEDS Report have been used to create Tables 2.1.1-12 through 2.1.1-15 for SO_x, NO_x, HC, and CO in Nevada. Only AQCR No. 147 in Nevada has been included in the tables since it contains the counties within the M-X deployment areas. Source categories have been grouped as stationary, mobile or natural to correspond with Tables 2.1.1-8 through 2.1.1-11.

Figures 2.1.1-5 through 2.1.1-8 are presented for the Nevada/Utah area as a visual assessment of the background gaseous particulate levels of SO_x, NO_x, HC, and CO, respectively. Data for these figures was obtained from the 1977 National Air Quality, Monitoring, and Emissions Trends Report.

Levels

Gaseous pollutants with established NAAQS are photochemical oxidants (ozone) (O_3), sulfur dioxide (SO_x), non-methane hydrocarbons (NMHC), and carbon monoxide (CO) and nitrogen dioxide (NO_2). Gaseous pollutants standards are shown in Table 2.1.1-16.

Nevada and Utah nonattainment areas for gaseous pollutants are shown in Figure 2.1.1-3. Gaseous pollutant nonattainment areas near to or within the Nevada/Utah deployment area are the following: Tooele County, Weber County, Davis County, Salt Lake County, Utah County, Ogden, Salt Lake City, and Provo in Utah; Steptoe Valley, Reno, Lake Tahoe Basin, and Las Vegas Valley in Nevada.

The Steptoe Valley SO_2 nonattainment status is due to a single emission source, a copper smelter at McGill. The Las Vegas Valley nonattainment status for CO and O_3 is due to a combination of mobile and stationary sources. The SO_2 nonattainment status in Cedar City was caused by the burning of high-sulfur fuel oil at a boiler at the Southern Utah College. High-sulfur oil is no longer burned at the college and ambient air quality violations are no longer recorded.

Figure 2.1.1-9 locates 1977 gaseous pollutant levels as measured in Nevada and Utah. Annual nitrogen dioxide levels measure from less than 10 percent to about 50 percent of the national air quality annual standard. Lowest NO_2 levels are measured in the southwestern Utah area. The eight-hour CO standard is exceeded at all locations measuring CO, except for Magna, Utah. The annual SO_2 standard was exceeded at Magna, Utah. However, this site measured less than four full quarters of data during 1977. The three-hour standard was violated at Cedar City, Utah and was nearly exceeded at Tooele, Utah. Twenty-four-hour standard

Table 2.1.1-12. Nevada SO_x emission inventory by AQCR*.

AQCR	STATIONARY SOURCES (TONS/YR)	MOBILE SOURCES (TONS/YR)	NATURAL SOURCES** (TONS/YR)	TOTAL (TONS/YR)
AQCR 147				
TOTAL	273,650	776	0	274,426
AREA	264	776	0	1,040
POINT	273,386	***	***	273,386

3370

* Data from 1975 National Emission Data System (NEDS) Report

** Forest fires are only emitters applicable to this category

*** Point source designation not applicable to this category

Table 2.1.1-13. Nevada NO_x emission inventory by AQCR*.

AQCR	STATIONARY SOURCES (TONS/YR)	MOBILE SOURCES (TONS/YR)	NATURAL SOURCES** (TONS/YR)	TOTAL (TONS/YR)
AQCR 147				
TOTAL	1,180	11,159	302	12,641
AREA	264	11,159	302	11,725
POINT	916	***	***	916

3371

* Data from 1975 National Emission Data System (NEDS) Report

** Forest fires are only emitters applicable to this category

*** Point sources designation not applicable to this category

Table 2.1.1-14. Nevada HC emission inventory by AQCR*.

AQCR	STATIONARY SOURCES (TONS/YR)	MOBILE SOURCES (TONS/YR)	NATURAL SOURCES** (TONS/YR)	TOTAL (TONS/YR)
AQCR 147				
TOTAL	1,534	12,329	1,810	15,673
AREA	220	12,329	1,810	14,359
POINT	1,314	***	***	1,314

3372

* Data from 1975 National Emission Data System (NEDS) Report

** Forest fires are only emitters applicable to this category

*** Point sources designation not applicable to this category

Table 2.1.1-15. Nevada CO emission inventory by AQCR*.

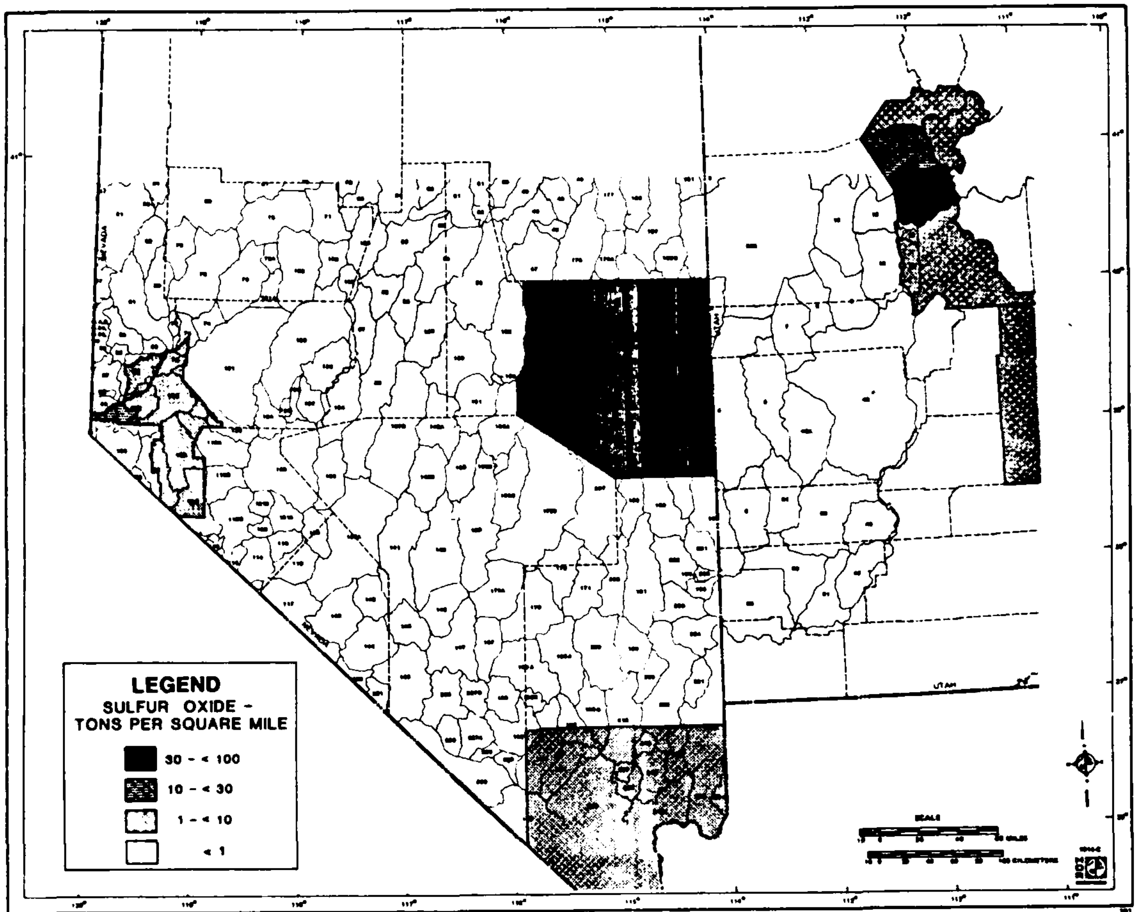
AQCR	STATIONARY SOURCES (TONS/YR)	MOBILE SOURCES (TONS/YR)	NATURAL SOURCES** (TONS/YR)	TOTAL (TONS/YR)
AQCR 147				
TOTAL	727	68,611	10,558	79,896
AREA	616	68,611	10,558	79,785
POINT	111	***	***	111

3373

* Data from 1975 National Emission Data System (NEDS) Report

** Forest Fires are only emitters applicable to this category

*** Point sources designation not applicable to this category



1338-A

Figure 2.1.1-5. Sulfur dioxide levels in the Nevada/Utah study area.

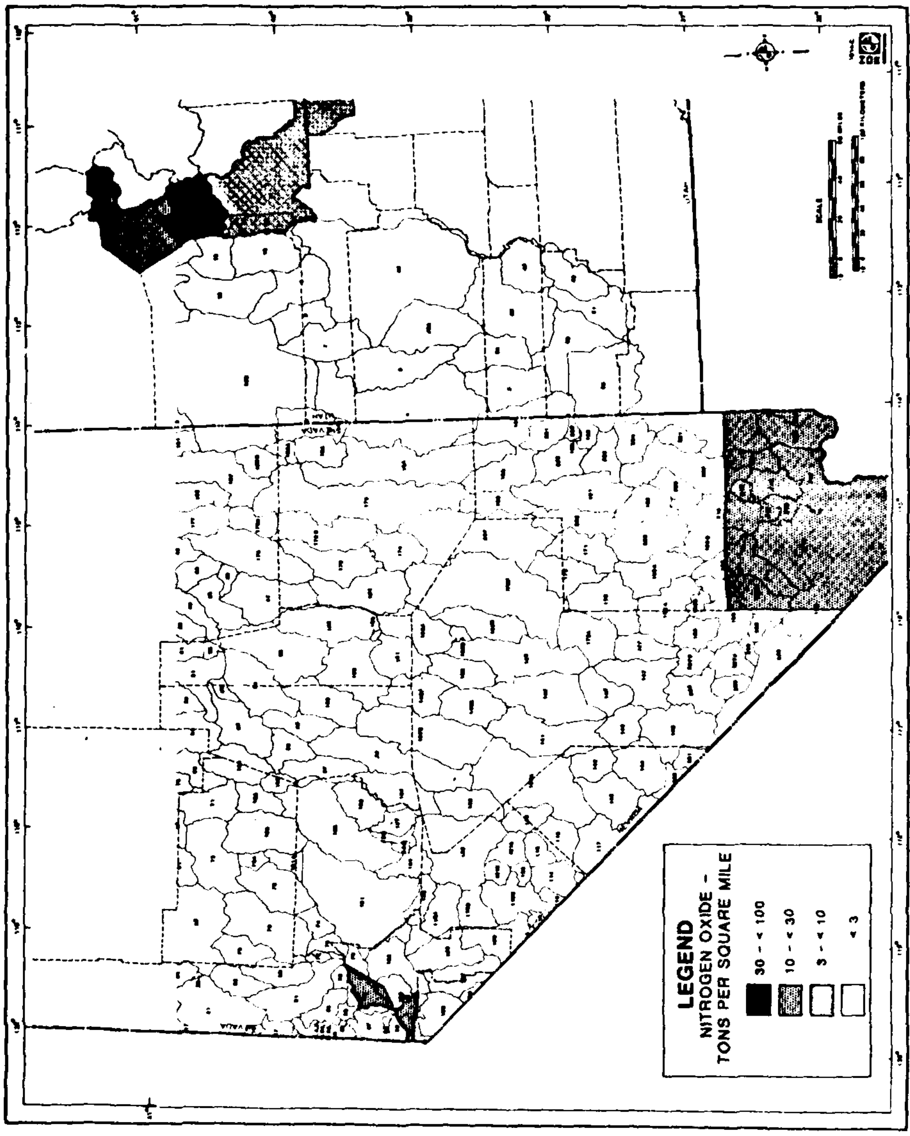


Figure 2.1.1-6. Nitrogen oxide levels in the Nevada/Utah study area.

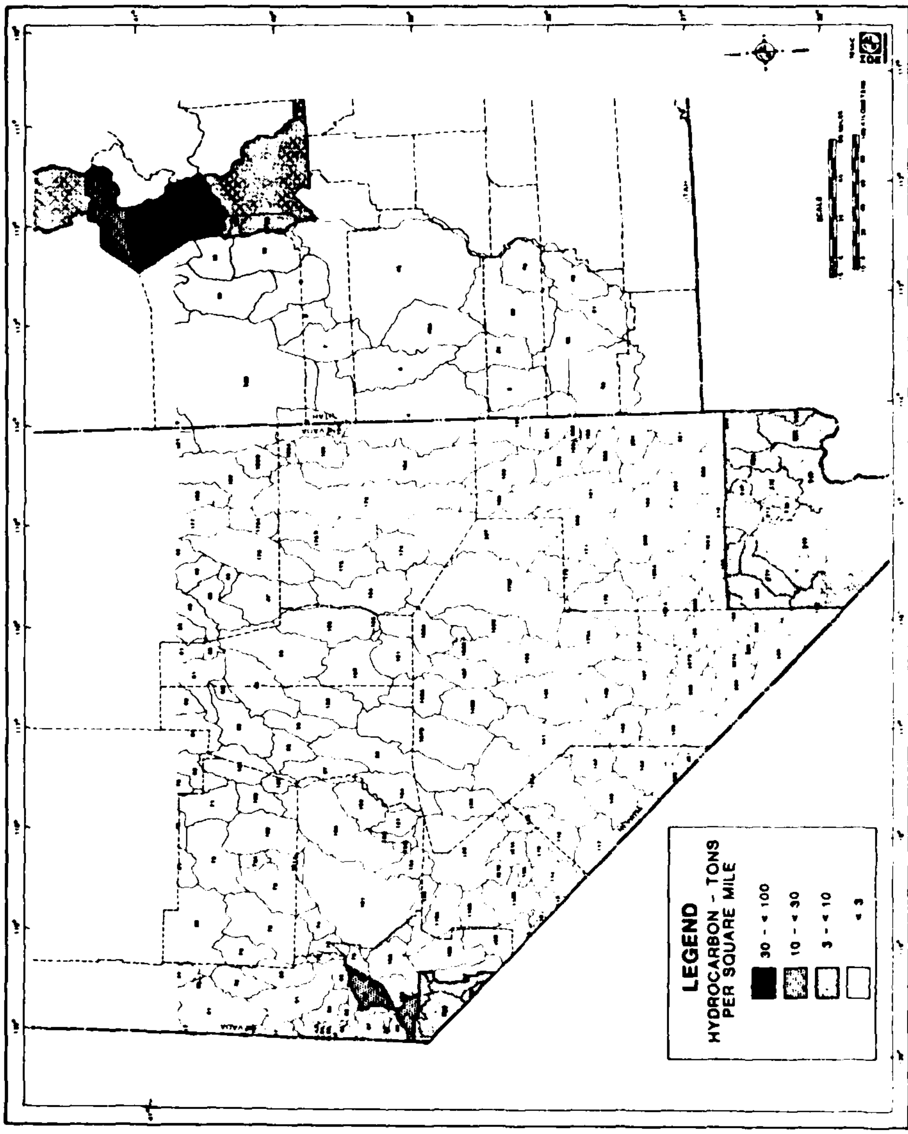
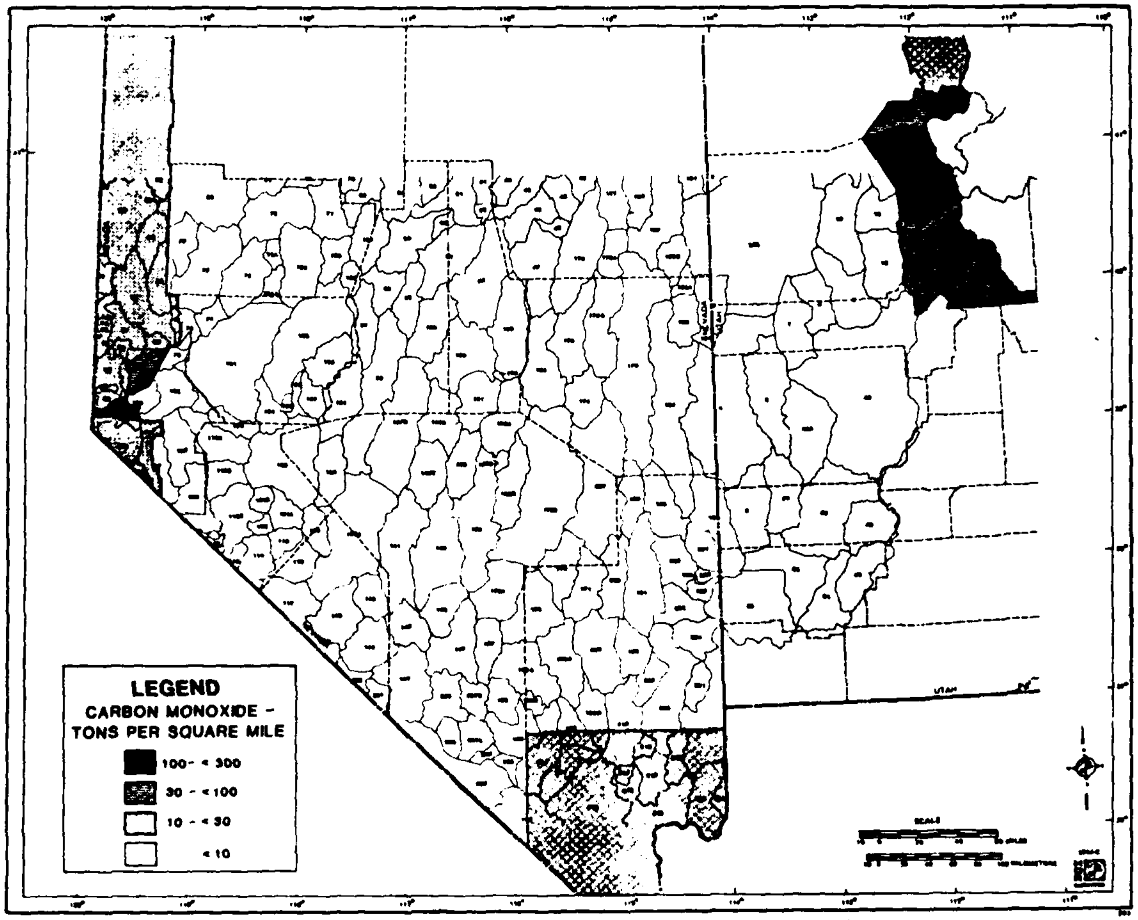


Figure 2.1.1-7. Hydrocarbon levels in the Nevada/Utah study area.



1337-A

Figure 2.1.1-8. Carbon monoxide levels in the Nevada/Utah study area.

Table 2.1.1-16. Summary of national ambient air quality standards (NAAQS) and Nevada and Utah* ambient air quality standards for gaseous pollutants.

POLLUTANT	AVERAGING TIME	NAAQS & UTAH STANDARDS		NEVADA STANDARDS
		PRIMARY	SECONDARY	PRIMARY
Carbon Monoxide	8-hour[a]	10 mg/m^3 (9 ppm)	Same as primary standards	Same as NAAQS
	1-hour	40 mg/m^3 (35 ppm)		Same as NAAQS
Carbon Monoxide above 5,000 feet MSL	8-hour	10 mg/m^3 (9 ppm)		6.67 mg/m^3 (6.0 ppm)
	1-hour	40 mg/m^3 (35 ppm)		Same as NAAQS
Ozone	1-hour[b]	235 $\mu g/m^3$ (0.12 ppm)	Same as primary standard	Same as NAAQS
Ozone (lake Tahoe Basin)	1-hour	n/a		195 $\mu g/m^3$
Nitrogen	Annual (Arithmetic Mean)	100 $\mu g/m^3$ (0.05 ppm)	Same as primary standard	Same as NAAQS
Hydrocarbons (corrected for methane)	3-hour (6-9 a.m.)	160 $\mu g/m^3$ (0.24 ppm)	Same as primary standard	Same as NAAQS
Sulfur Dioxide	Annual (Arithmetic Mean)	80 $\mu g/m^3$ (0.03 ppm)	Same as primary standard	Same as NAAQS
	24-hour[a]	365 $\mu g/m^3$ (0.14 ppm)		Same as NAAQS
	3-hour	none	1,300 $\mu g/m^3$ (0.5 ppm)	1,300 $\mu g/m^3$ (0.5 ppm)

725

*All Utah standards are equivalent to NAAQS.

[a]Not to be exceeded more than once per year.

[b]The ozone standard is attained when the expected number of days per calendar year with a maximum hourly average concentration above the standard is equal to or less than one.

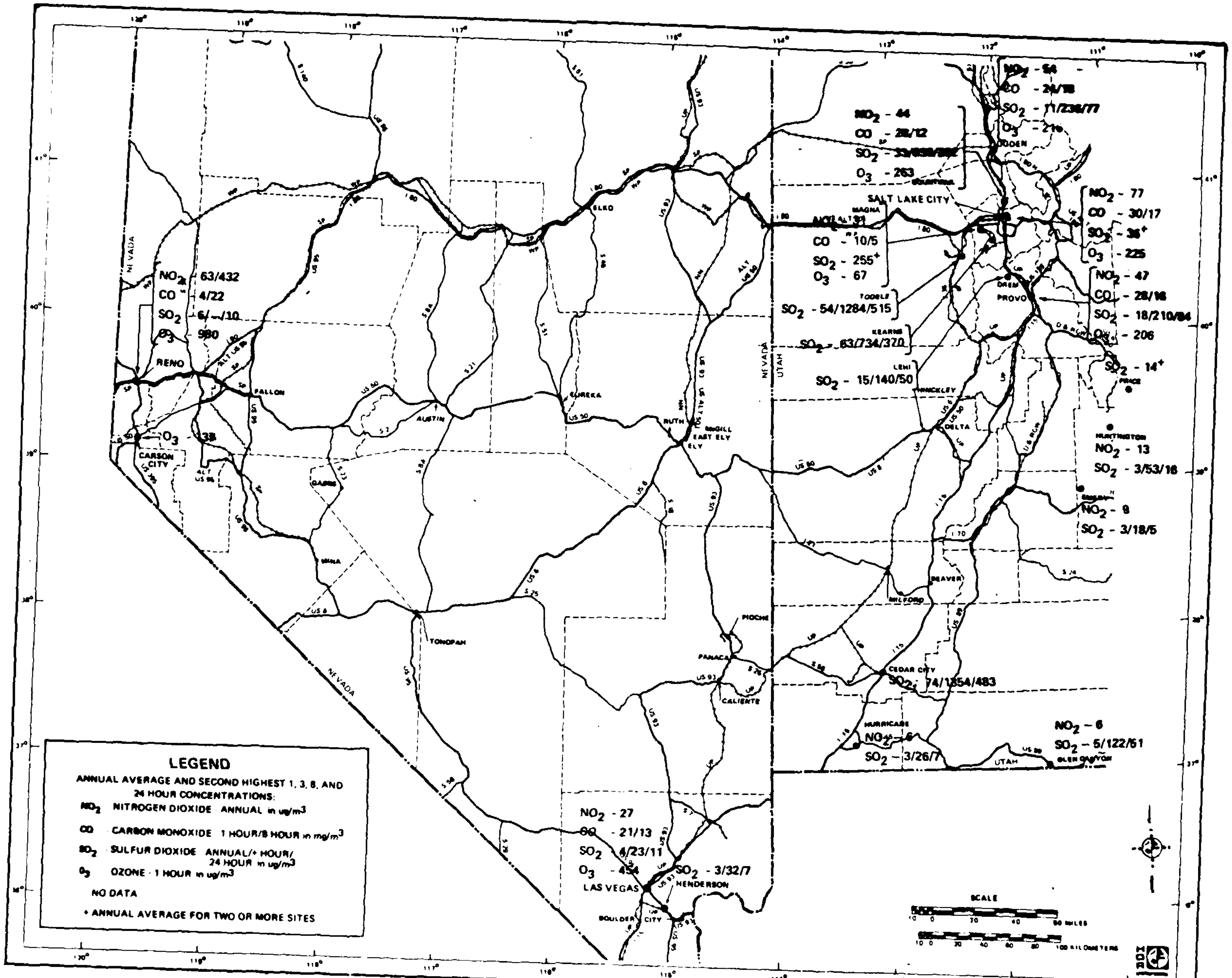


Figure 2.1.1-9. Air quality levels in the Nevada/Utah study area.

violations were recorded at Cedar City, Tooele, and Kearns, Utah. SO_2 measurements in the Steptoe Valley may have exceeded SO_2 standards during 1977, as indicated by its nonattainment status. Ozone excesses in 1977 were recorded in Reno and Las Vegas, Nevada, and Bountiful, Utah.

Visibility

An increasingly important air quality concern in the western United States where scenic topographic features and excellent visual range produce numerous exceptional vistas, is the issue of visibility impairment. Public interest in the west in the visibility issue has grown in recent years leading to the initiation of various monitoring and modeling studies. Concern over possible decreases in visibility is also reflected in the Clean Air Act Amendments of 1977 which contain provisions for the protection of visibility in federally-mandated Prevention of Significant Deterioration (PSD) Class I areas. In addition, some states have promulgated standards designed to maintain good visibility.

Visibility and visibility impairment can be defined in several ways. The most common index of visibility is visual range, which is defined as the farthest distance from which one can see a large black object against the horizon sky. However, the ability to discern colors and the color contrast of objects such as distant mountains, clouds, and the sky is also an important visual index. Impairment of visibility can be defined as a reduction of visible range or atmospheric discoloration. Visibility impairment produced by man's activities is generally defined as one of three types: (1) widespread regional haze which reduces visibility in every direction from an observer, (2) plumes of gaseous and particulate emissions that obscure the sky, horizon, or terrain near large pollutant sources (plume blight), and (3) layers of discoloration appearing above the surrounding terrain. EPA has defined anthropogenic visibility impairment as any humanly perceptible change in visual range, contrast, atmospheric color, or other convenient visibility measure from that which would have existed under natural conditions.

The most commonly measured or observed visibility index is visual range, which is routinely tabulated at many airports. A map of medium annual visual range appears in Figure 2.1.1-10. The map is based on a limited number of data points, but is sufficient to show the generally high visual range of greater than 70 mi (110 km) that occurs in Nevada and Utah.

Despite the fact that visibility is still quite good in the west and southwest United States relative to the rest of the country, visibility has been deteriorating. Comparison of visibility data in the southwest for the 1950's to data for the 1970's shows substantial decreases for both urban and nonurban locations (reference). At Ely, Nevada, the visual range decreased 42 percent during the period 1954 to 1971 (Figure 2.1.1-11). Decreases have even been experienced in extremely remote areas. It has been suggested that the reason for this general region-wide decrease is the increasing regional levels in the atmosphere of secondary aerosols such as sulfates and nitrates.

In Section 169A(a) of the Clean Air Act (as amended in 1977) Congress established as a national goal "the prevention of any future and remedying of any existing impairment of visibility in mandatory Class I federal areas, which impairment results from man-made air pollution." The Act required that EPA promulgate

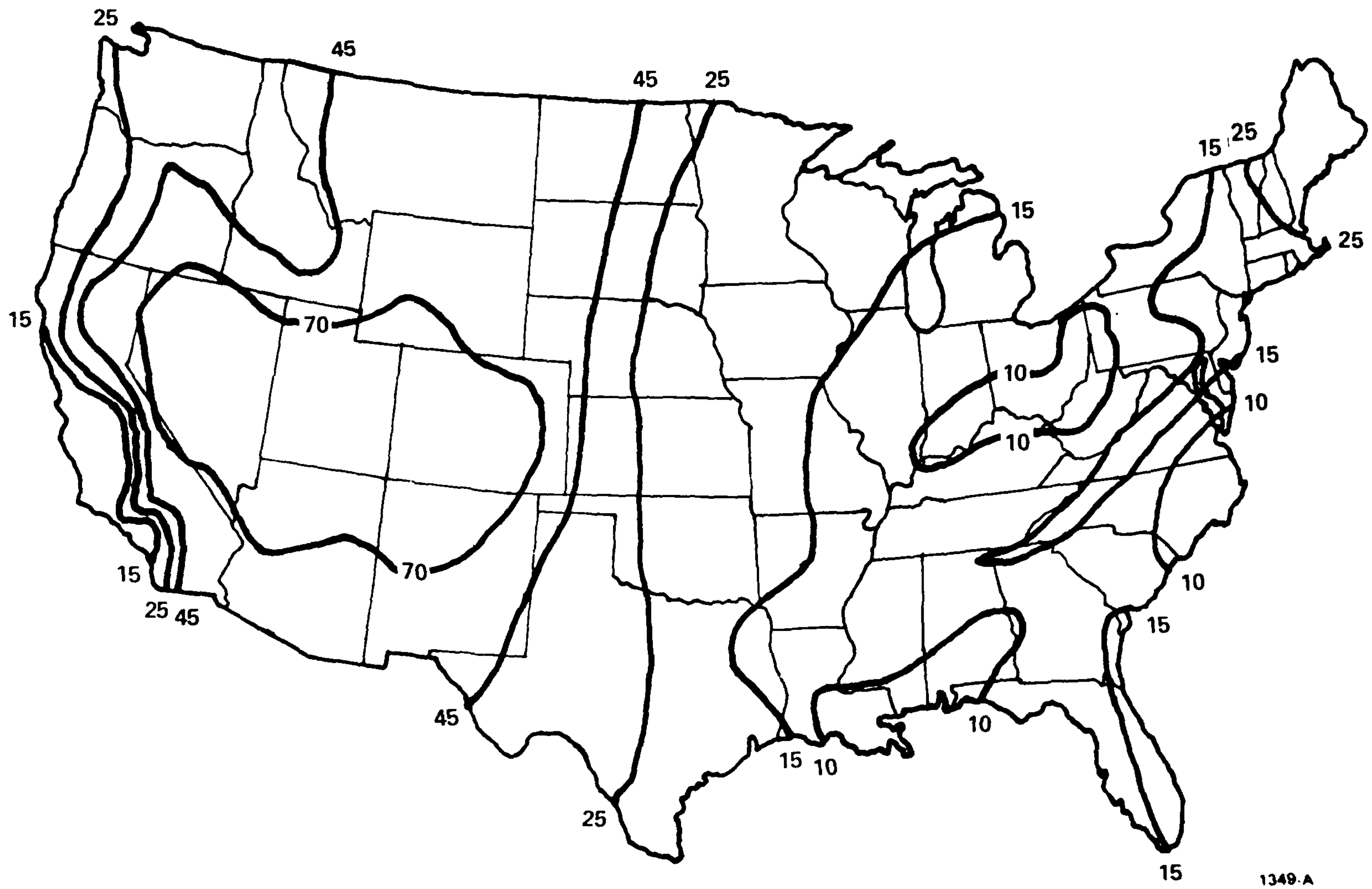


Figure 2.1.1-10. Median yearly visual range (miles) for suburban/non-urban areas, 1974-1976.

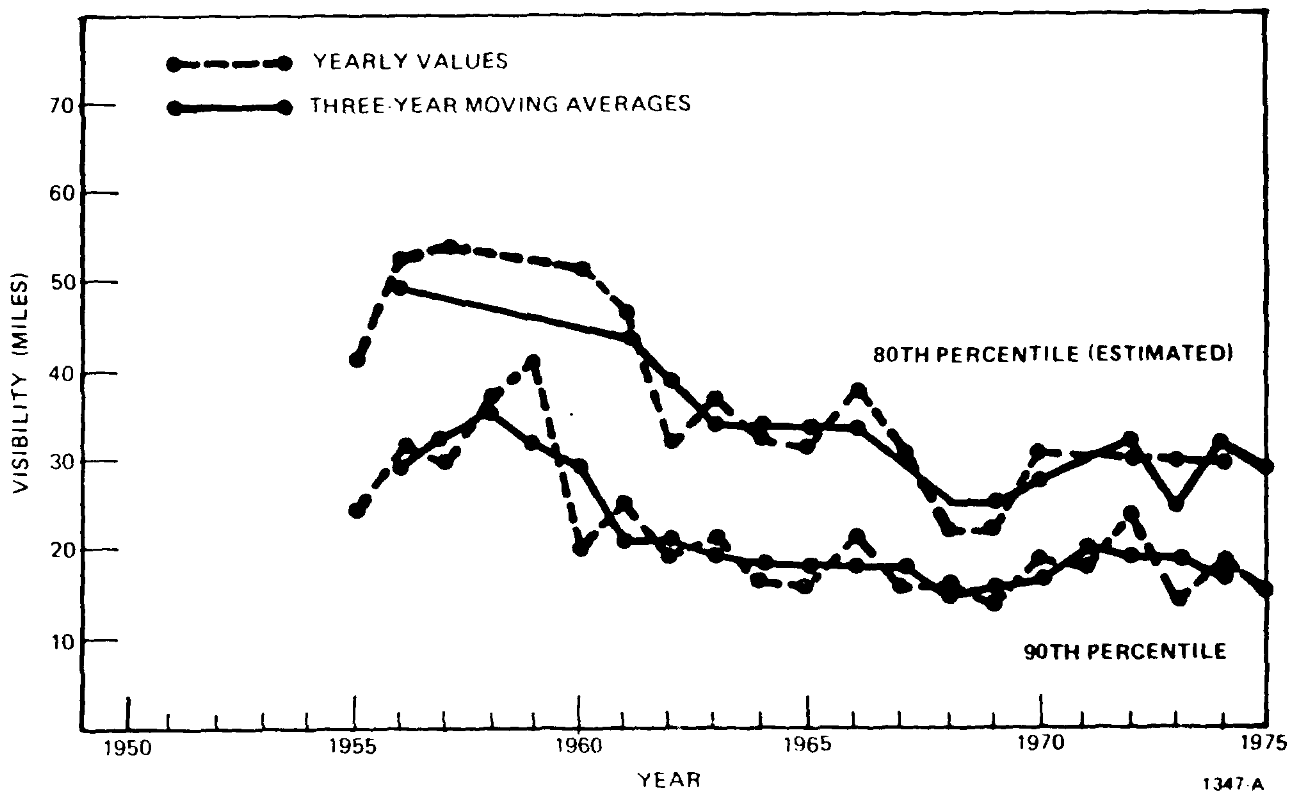


Figure 2.1.1-11. Long term visibility trends at Ely, Nevada.

a list, compiled by the Department of Interior and other federal Land Managers, of mandatory Class I federal areas in which visibility is an important value. This list was promulgated in 1979 and contained 156 of the 158 Class I areas. EPA is also mandated to promulgate regulations which provide guidelines to the states on appropriate techniques for implementing the national visibility goal and to require that states incorporate into their State Implementation Plan (SIP's) measures needed to make reasonable progress towards this goal. The guidelines must require existing major stationary sources that impair visibility to install the best available retrofit technology (BAER) and that SIP's include a long-term strategy towards meeting visibility goals.

As of this date, EPA has not formally proposed visibility regulations. It is apparent that considerable interpretation of the definition of visibility impairment may be necessary before a standard is promulgated. The location as well as spatial and temporal extent of visibility impairment must be defined. Sources outside of Class I areas may impair visibility both in and from the Class I areas.

It is expected that the federal land managers will have much input towards defining visibility regulations in their areas. Public opinion may play an important role also. It is likely that the regulations will vary from region to region, state to state, and even from Class I area to Class I area. Initial attention is expected to be focused on the problem of plume blight because it is the most easily recognized visibility problem in terms of impact and source. The problem of regional visibility impairment is one that will be addressed, but probably not until measures have been taken to deal with plume blight.

The federal Land Managers have defined the status of visibility impairment in the Class I areas as well as the potential sources of this impairment. The status of regions corresponding to the Nevada/Utah siting region is summarized in Table 2.1.1-17. Visibility problems in the Nevada/Utah region appear to be more related to visible plumes and plume discoloration than to regional haze.

At this date Nevada is the only state in the two M-X basing regions that has an ambient visibility standard. The standard is exceeded when pollutant concentrations reduce the prevailing visibility to less than 30 mi when the humidity is less than 70 percent. Prevailing visibility is defined as the greatest visibility which is attained or surpassed around at least half of the horizon circles, but not necessarily in continuous sectors. Both Nevada and Utah have some form of visible emission standard. These regulations generally apply only to smoke or combustion-related stationary sources.

Visibility impairment by atmospheric pollutants consists of scattering and absorption of visible light by both gases and particulates. The major contributions to reduced visibility result from absorption by nitrogen dioxide gas and scattering and absorption by particles in the atmosphere. The absorption of light per particle volume is only weakly dependent on particle size. However, scattering of light per particle volume is most efficient among small particles between 0.1 um and 1.0 um which peak at around 0.5 um. Thus, it is fine particles resulting from direct or primary emissions from combustion sources as well as secondary particles resulting from atmospheric transformation of reactive gases that contribute most to atmospheric visibility impairment.

Table 2.1.1-17. Status of class visibility impairment in M-X siting region.

REGION	REPORTED VISIBILITY STATUS	OBSERVED VISIBILITY PHENOMENA	POTENTIAL SOURCES		POTENTIAL FUTURE IMPAIRMENT
			MAN-MADE	NATURAL	
Southeast Nevada	Some Impairments need to assess noted.	1. Haze (Intermittent) 2. Visible plumes 3. Discoloration (Brown, Yellow, bands)	1. Power plants smelters, urban plumes 2. Power plants, miscellaneous small sources	1. Natural haze 2. Wild-fires	Possible decrease in smelter impacts. Significant population growth in Utah.

745-1

TEXAS/NEW MEXICO (2.1.2)

The Texas/New Mexico basing area is located on the plateau area of eastern New Mexico and the Texas Panhandle often referred to as the High Plains region. This region is semiarid in nature - transitional between desert to the west and humid climates to the east and south. It is essentially a level region with no terrain features affecting wind flow across the plateau. Wind speeds can be extremely high at times. Precipitation is relatively low on the average but can be extremely variable from year to year. The precipitation peak occurs during summer months when the primary source of rain is thunderstorms.

Temperature

Normal maximum temperatures are 50 to 60 degrees F in January and 90 to 100 degrees F in July. Normal minimum temperatures are 20 to 30 degrees F in January and 60 to 70 degrees F in July. The daily temperature range is not quite as great as in Nevada/Utah but still tends to fall in the range of 20 to 30 degrees F throughout the year.

Precipitation

Average annual precipitation levels for the Texas/New Mexico region are displayed in Figure 2.1.2-1. Most areas in this region receive on the average between 12 and 22 inches of precipitation annually. There is a pronounced east-west gradient to the precipitation pattern with larger amounts falling in the eastern section. This is a result of the closer proximity of this area to the moisture-laden air transported north from the Gulf of Mexico. The major portion of the precipitation in the Texas/New Mexico region falls during the summer months during frequent thunderstorms. More than 70 percent of the annual precipitation at Amarillo, Texas falls from May to September.

Wind Speeds and Mixing Heights

The dispersive ability of the atmosphere in the Texas/New Mexico basing area is good. The seasonal and annual averaged morning and afternoon mixing heights and wind speeds appear in Table 2.1.2-1. Afternoon mixing heights are large, particularly during the spring through autumn seasons, and wind speeds are brisk. Morning mixing heights are low in comparison. This is a result of nocturnal radiation producing surface-based temperature inversions on a frequent basis. These inversions break up a few hours after sunrise as surface heating by the sun causes vertical mixing in the atmosphere. The prevailing surface wind direction in the Texas/New Mexico region is from the south to southwest.

Stability

Atmospheric stability varies seasonally and diurnally in the basing region. The frequency of stability conditions is summarized in Table 2.1.2-2. In the Texas/New Mexico region the atmospheric stability is generally neutral owing to the high wind speeds of the region producing a well-mixed atmosphere. Unstable conditions occur infrequently, but occur more often in the summer due to the higher solar heating at the surface. Stable conditions occur slightly more frequently in the autumn and winter than in the rest of the year.

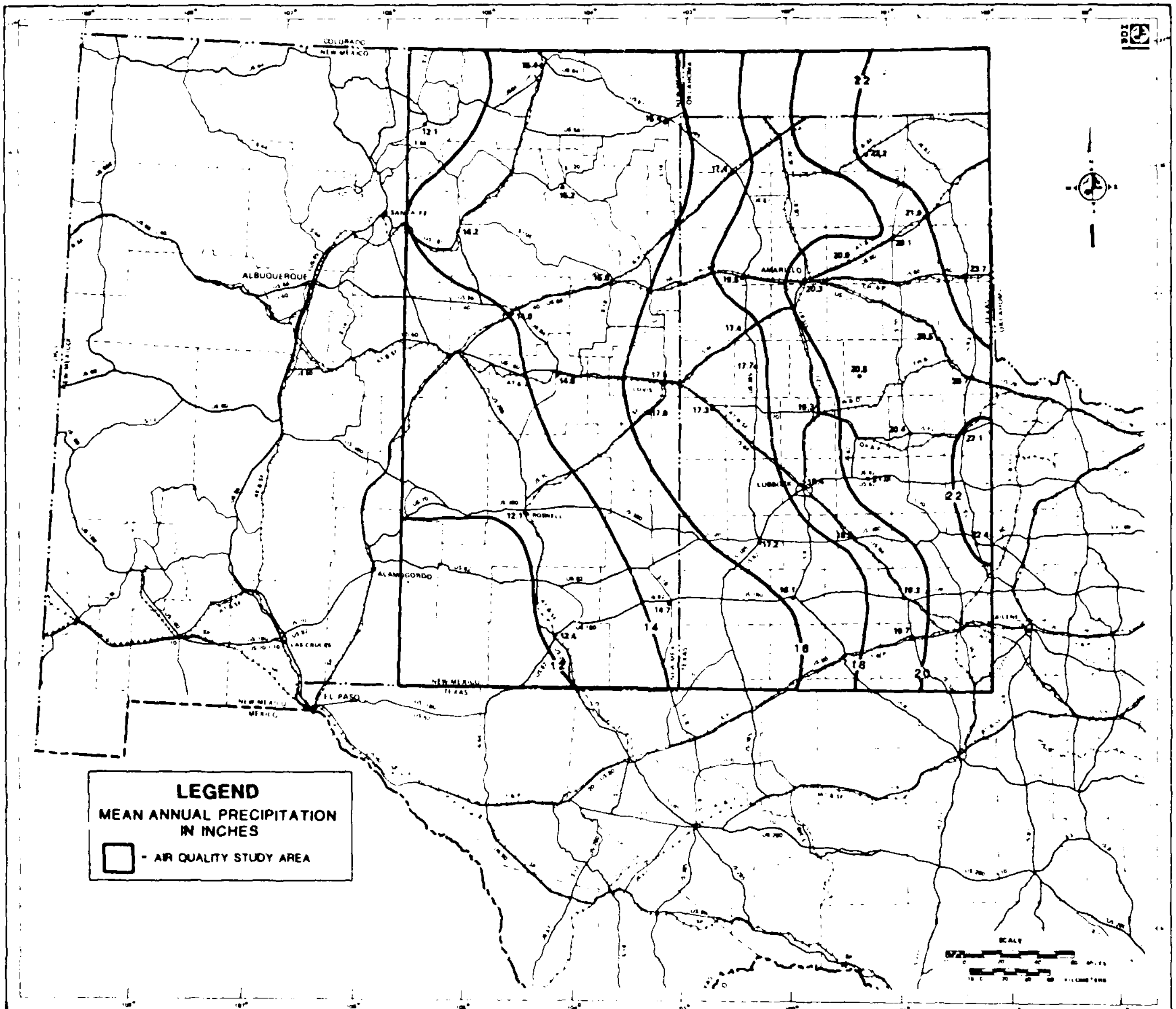


Figure 2.1.2-1. Precipitation in the Texas/New Mexico study area.

Table 2.1.2-1. Wind speeds and mixing heights for stations in Texas/New Mexico.

STATION	TIME	WINTER		SPRING		SUMMER		AUTUMN		ANNUAL	
		HT[1]	U[2]	HT	U	HT	U	HT	U	HT	U
Albuquerque, NM.	Morning	391	4.0	553	4.5	582	3.7	414	3.5	485	4.9
	Afternoon	1464	5.8	3452	8.9	3941	6.0	2295	5.5	2788	6.5
Amarillo, TX.	Morning	273	6.9	337	8.1	379	7.4	323	6.8	328	7.3
	Afternoon	1171	8.5	2507	10.1	2520	7.4	1693	7.6	1973	8.4
Midland, TX	Morning	290	5.7	429	7.5	606	7.2	419	6.0	436	6.6
	Afternoon	1276	7.8	2449	9.0	2744	6.7	1887	6.7	2089	7.5

830

[1] Mixing height given in meters.

[2] Wind speeds are averaged through the mixed layer and are in units of meters per second.

Table 2.1.2-2. Average range of frequency of stability conditions in the Texas/New Mexico region.

SEASON	PERCENT FREQUENCY OF STABILITY CONDITIONS		
	TEXAS/NEW MEXICO		
	STABLE	NEUTRAL	UNSTABLE
Winter	25-35	65-75	5-15
Spring	15-25	65-75	5-15
Summer	15-25	45-55	15-25
Autumn	25-35	55-65	5-15
Annual	15-25	55-65	5-15

831-1

Dust Storms

Due to the desert or semiarid nature of most of the land in the basing region, dust is occasionally blown into the atmosphere by wind. At times this natural windblown dust can be of sufficient magnitude to restrict visibility. Table 2.1.2-3 contains data on the frequency of dust observations for the basing region. The Texas Panhandle-eastern New Mexico area is the worst area in the entire United States for windblown dust, experiencing the most frequent dust observations in March and April. This is primarily due to the fact that maximum wind speeds for the year occur during these months. Additionally, the minimum rainfall occurs during the winter and early spring which decreases soil moisture and correspondingly increases the potential for soil erosion.

Baseline Particulates

Baseline particulate data for the state of New Mexico have been extracted from a 1978 area and point-source emission summary which gives source category emissions on a county-by-county basis (see Table 2.1.2-4). Included as source categories are: highway vehicles, off-highway vehicles, and other transportation (mobile sources); process industries, solid waste burning, space heating, and electric power generation (stationary sources); dirt roads and forest fires (fugitive dust sources). Three categories of as fugitive dust sources are missing from the New Mexico data. They are dust from construction activity, dust from agricultural activity, and, natural windblown sources. These activities need to be considered in greater detail to determine if a value should be calculated and included as a significant effect.

Data from the 1975 National Emissions Data System (NEDS) Report have been used for a first-step evaluation of baseline particulate levels in Texas candidate site areas (see Table 2.1.2-5). AQCR No. 211 contains the counties which are within the possible deployment areas. The source categories have been grouped as either stationary sources or mobile sources. A large gap exists here in that the NEDS report does not include categories that would be considered as fugitive dust sources. Particulate totals reported in an earlier point-source inventory for counties in Texas are shown in Table 2.1.2-6.

Assessment of background particulate levels may be made from information contained in the 1977 National Air Quality, Monitoring and Emissions Trends Report. Data from this report are presented as TSP emission density maps for the Texas/New Mexico deployment area in Figure 2.1.2-2. Note that the highest background particulate levels to be found in the deployment areas are less than 10 tons/mi^2) (3.5 tonnes/km^2). These levels as mentioned do not include values of particulate emission from fugitive dust sources.

Air Quality Levels

NAAQS and state standards for TSP and lead applicable in the Texas/New Mexico area are shown in Table 2.1.2-7. In addition to the NAAQS, Texas has implemented more strict short-term particulate standards that apply to a single source or group of contiguously located sources. New Mexico has adopted the stricter NAAQS secondary standard as their primary standard. No lead standard other than the NAAQS has been adopted in New Mexico or Texas.

Table 2.1.2-3. Monthly percent frequency of dust observation in Texas/New Mexico region.

STATION	PERCENTAGE OF HOURLY WEATHER OBSERVATION												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	ANN
Texas/New Mexico													
Clovis, NM	1.400	3.100	6.000	5.500	2.700	1.500	0.500	0.300	0.700	0.600	1.000	2.000	2.000
Clayton, NM	2.400	0.620	3.348	1.541	0.427	0.284	0.061	0.061	0.346	0.065	0.068	0.304	0.610
Amarillo, TX	0.700	2.100	2.400	3.200	1.100	0.700	0.300	0.100	0.400	0.400	0.600	1.300	1.200
Lubbock, TX	2.900	4.500	7.700	7.600	4.500	2.800	0.500	0.200	0.500	0.500	1.400	3.400	3.100

832-1

Source: Orgill and Schmal, (1975).

Table 2.1.2-4. Baseline particulate emission levels in New Mexico.

REGION/COUNTY	STATIONARY SOURCES TONS/YR	MOBILE SOURCES TONS/YR	FUGITIVE DUST SOURCES TONS/YR	TOTAL TONS/YR	AREA OF COUNTY MI^2	DENSITY = TOTAL/AREA TONS/YR/MI^2
AQCR 155 Pecos-Permian Basin Intrastate						
Chaves	3,080	378	0	3,458	6,084	0.57
Curry	932	578	0	1,510	1,403	1.08
De Baca	346	42	0	388	2,356	0.16
Eddy	18,639	277	5	18,921	4,167	4.54
Lea	1,928	345	2	2,275	4,392	0.52
Quay	1,898	185	3	2,086	2,875	0.73
Roosevelt	61	129	9	199	2,454	0.08
ACQR 157 Upper Rio Grande Valley Intrastate						
Taos	9,735	128	10	9,873	2,256	4.38
ACQR 153 Las Cruces-Alamogordo Interstate						
Lincoln	58	105	22	185	4,858	0.04
Otero	4,356	955	30	5,341	6,638	0.80
ACQR 154 Northeastern Plains Interstate						
Colfax	10,355	126	17	10,498	3,764	2.79
Guadalupe	74	151	7	232	2,998	0.08
Harding	25	15	5	45	2,134	0.02
Mora	111	46	10	167	1,940	0.09
San Miguel	227	157	21	405	4,741	0.09
Torrance	49	143	15	207	3,346	0.06
Union	14	65	2	81	3,816	0.02

3300

Source: 1978 Area and Point Source Emission Summary for State of New Mexico

Table 2.1.2-5. Texas particulate emission inventory by AQCR.[1]

AQCR	STATIONARY SOURCES (TONS/YR)	MOBILE SOURCES (TONS/YR)	FUGITIVE DUST SOURCES (TONS/YR[2]	TOTAL (TONS/YR)
AQCR 211				
Total	46,213	5,710	0	51,923
Area	4,866	5,710	0	10,576
Point	41,347	—[3]	—[3]	41,347

841

[1]Data from 1975 National Emissions Data System (NEDS) Report.

[2]Forest fires are only emitters applicable to this category.

[3]Point source designation not applicable to this category.

Table 2.1.2-6. Baseline particulate emission rates in Texas.

COUNTY	PARTICULATE (TONS/YR)
Bailey	1,648
Castro	2,161
Cochran	114
Dallam	710
Deaf Smith	1,729
Hale	2,031
Hartley	358
Hockley	988
Lamb	1,908
Lubbock	1,602
Moore	2,434
Oldham	1,296
Parmer	2,473
Potter	9,838
Randall	170
Sherman	626
Swisher	2,306

3305

Source: 1971 Point Source Inventory for State of Texas.

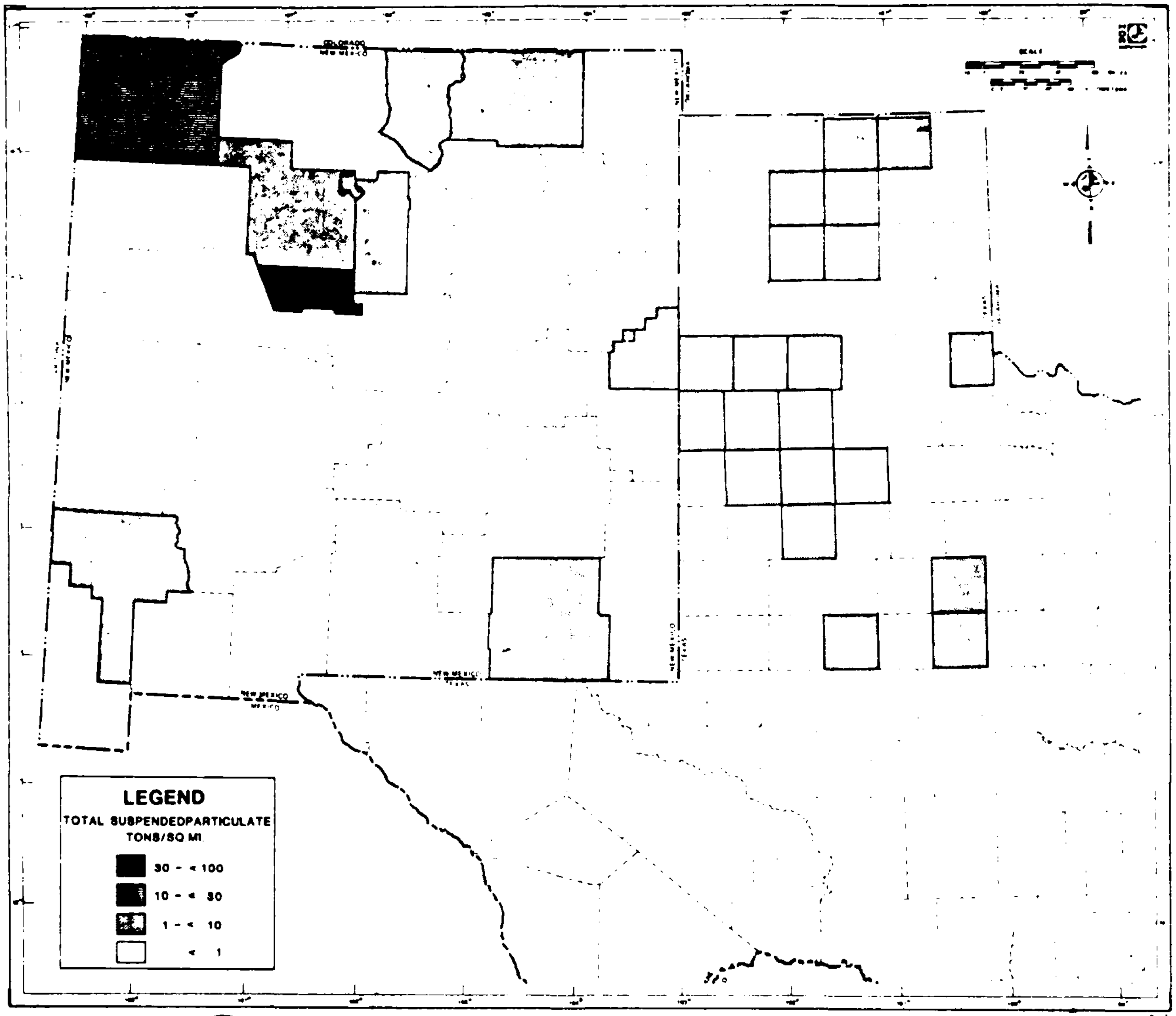


Figure 2.1.2-2. Suspended particulates in the Texas/New Mexico study, study area.

Table 2.1.2-7. Summary of national ambient air quality standards (NAAQS) and New Mexico and Texas ambient air quality standards for total suspended particulates and lead.

POLLUTANT	AVERAGING TIME	NAAQS		TEXAS STANDARDS	NEW MEXICO STANDARDS
		PRIMARY	SECONDARY		
Total Suspended Particulate Matter	Annual (Geometric Mean)	75 $\mu g/m^3$	60 $\mu g/m^3$ [1]	Same as NAAQS	60 $\mu g/m^3$
Total Suspended Particulate Matter	24-hour[2]	260 $\mu g/m^3$	150 $\mu g/m^3$	150 $\mu g/m^3$	150 $\mu g/m^3$
Total Suspended Particulate Matter	1-hour[3]	--	--	400 $\mu g/m^3$	None
Total Suspended Particulate Matter	3-hour[3]	--	--	200 $\mu g/m^3$	None
Total Suspended Particulate Matter	5-hour[3]	--	--	100 $\mu g/m^3$	None
Lead	Quarterly (Arithmetic Mean)	1.5 $\mu g/m^3$	--	Same as NAAQS	Same as NAAQS

[1] Secondary annual NAAQS TSP standard (60 $\mu g/m^3$) is a guide for assessing state implementation plans.

[2] Not to be exceeded more than once per year.

[3] Not to be exceeded any time by any single major stationary source or group of sources located on contiguous property.

Nonattainment areas in the Texas and New Mexico deployment area are shown in Figure 2.1.2-3. The area that is pertinent to the study of air quality effects in the deployment area is shown by the inner border. TSP nonattainment areas in Lea and Eddy Counties are the only nonattainment areas in the air quality study area.

Mandatory Class I areas and current Class II areas recommended for consideration for redesignation to Class I status in the Texas/New Mexico study are also given in Figure 2.1.2-3. Mandatory Class I areas in Texas and New Mexico include Carlsbad Caverns, White Mountain wilderness area, Wheeler Peak wilderness area and Pecos wilderness area.. These mandatory Class I areas have air quality regulatory restrictions concerning air quality TSP increments that cannot be exceeded (see Table 2.1.1-7). The Capulin Mountain National Monument has been recommended for consideration for redesignation to Class I status. The remaining area within the study area in attainment of NAAQS is designated as Class II. Class II increments for TSP are 19 ug/m^3 and 37 ug/m^3 for annual and 24-hour periods, respectively.

TSP levels in the Texas High Plains air quality study area are shown in Figure 2.1.2-4. Annual and 24-hour average TSP levels are greater than 50 percent of the primary NAAQS at all sites.

Baseline Gaseous Pollutants

Sources (Emissions)

Baseline gaseous pollutant levels for each of the deployment areas within the states of Texas and New Mexico are necessary in order to accurately assess the emission impact created by the construction and deployment of the M-X system. The Texas/New Mexico region is open terrain over which pollutant dispersal may cover large areas. Emission data on a county-by-county level is available.

Baseline data on gaseous pollutants for the State of New Mexico was extracted from a 1978 area and point-source emissions summary which gives source category emissions on a county-by-county basis (see Tables 2.1.2-8 through 2.1.2-11). The source categories listed in the tables are:

- o mobile sources - which include highway vehicles, off-highway vehicles, and other transportation
- o stationary sources - which include process industries, solid waste burning, space heating, and electric power generation
- o natural sources - which include forest fires

Gaseous pollutant baseline levels in Texas were obtained from the 1975 NEDS Report and used to create Tables 2.1.2-12 through 2.1.2-15 for SO_x, NO_x, HC, and CO. Only AQCR No. 211 has been included in the tables since it contains the counties within the possible M-X deployment areas. Source categories have been grouped as stationary, mobile, or natural sources to correspond with Tables 2.1.2-8 through 2.1.2-11. Totals reported in the point-source inventory for counties in the Texas deployment area are given in Table 2.1.2-16.

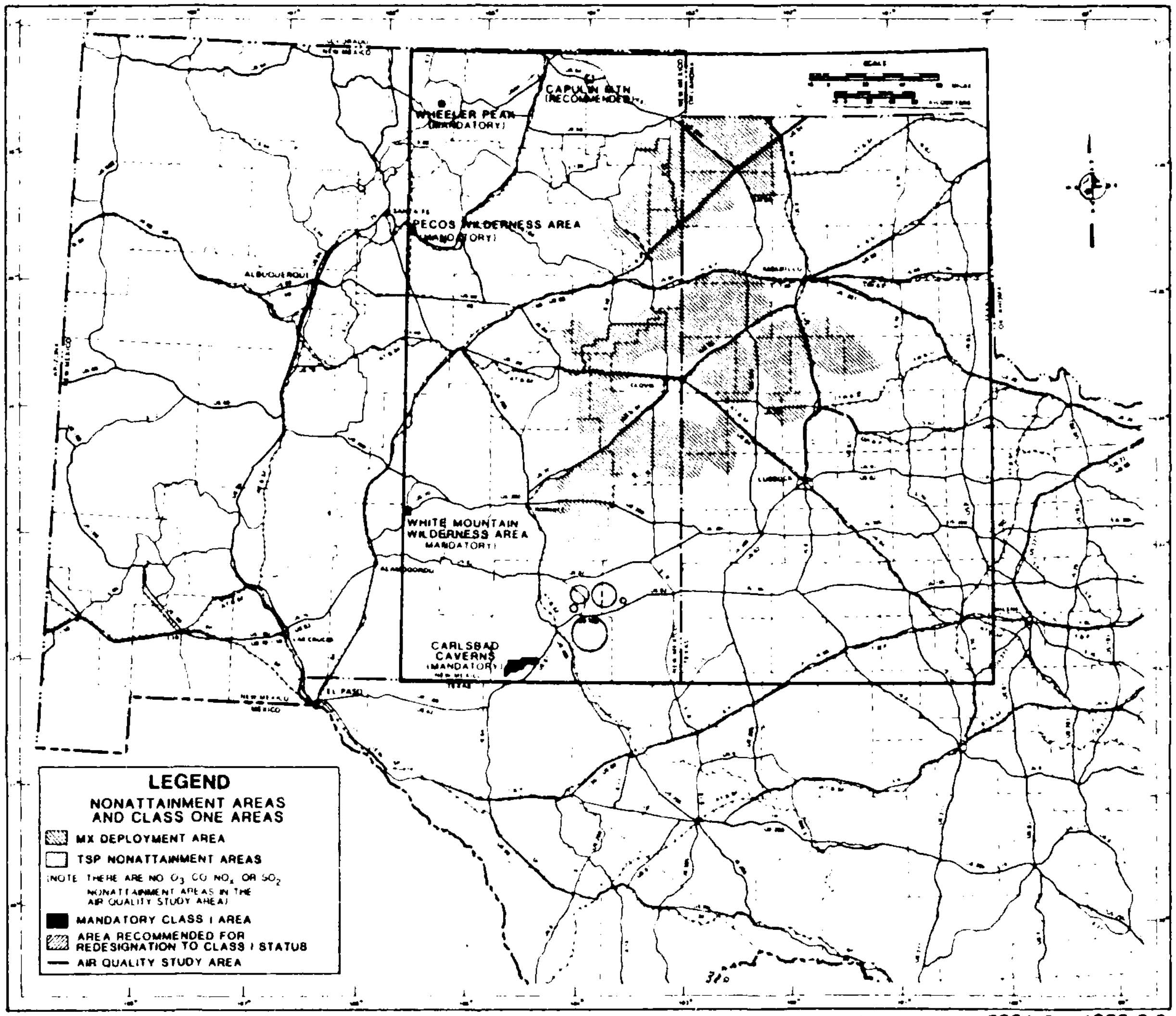


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Figure 2.1.2-3. Class I areas and non attainment areas in the Texas and New Mexico study area.

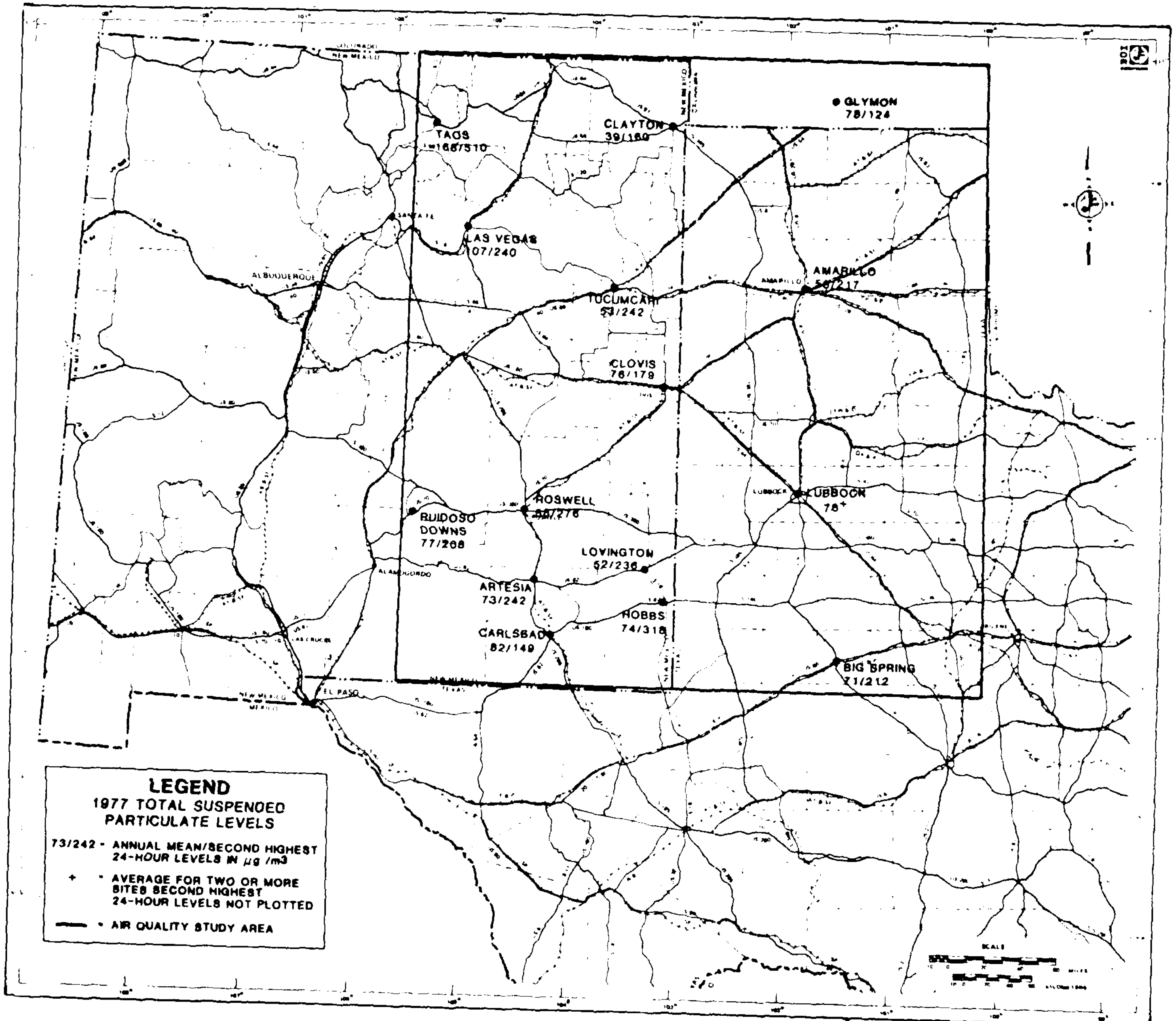

Figure 2.1.?-4. Suspended particulates in the Texas/New Mexico study area.

Table 2.1.2-8. Baseline SO_2 emission levels in New Mexico.

REGION/COUNTY	STATIONARY SOURCES TONS/YR	MOBILE SOURCES TONS/YR	NATURAL SOURCES TONS/YR	TOTAL TONS/YR	AREA OF COUNTY MI^2	DENSITY — TOTAL AREA TONS/YR/MI^2
AQCR 155						
Pecos-Permian						
Basin Intrastate						
Chaves	339	238	0	577	6,084	[illegible]
Curry	301	263	0	564	1,403	[illegible]
De Baca	7	19	0	26	2,356	.01
Eddy	27,106	201	0	27,307	4,167	[illegible]
Lea	108,605	241	0	108,846	4,392	24.78
Quay	23	88	0	111	2,875	[illegible]
Roosevelt	1,526	90	0	1,616	2,454	.66
AQCR 157						
Upper Rio Grande						
Valley Intrastate						
Taos	72	90	0	162	2,[illegible]	[illegible]
AQCR 153						
Las Cruces-						
Alamogordo						
Intrastate						
Lincoln	16	54	0	70	4,858	[illegible]
Otero	189	328	0	517	6,638	[illegible]
AQCR 154						
Northeastern						
Plains Interstate						
Colfax	176	74	0	250	3,764	[illegible]
Guadalupe	15	54	0	69	2,998	[illegible]
Harding	5	9	0	14	2,134	[illegible]
Mora	54	27	0	81	1,940	[illegible]
San Miguel	53	103	0	156	4,741	[illegible]
Torrance	10	58	0	68	3,346	[illegible]
Union	14	36	0	50	3,816	[illegible]

33[illegible]

Source: 1978 Area and Point Source Emission Summary for State of New Mexico.

Table 2.1.2-9. Baseline NO_x emission levels in New Mexico.

REGION/COUNTY	STATIONARY SOURCES TONS/YR	MOBILE SOURCES TONS/YR	NATURAL SOURCES TONS/YR	TOTAL TONS/YR	AREA OF COUNTY MI^2	DENSITY = TOTAL/AREA $TONS/YR/MI^2$
ACQR 155 Pecos-Permian Basin Intrastate						
Chaves	685	3,115	0	3,800	6,084	.62
Curry	249	2,748	0	2,997	1,403	2.14
De Baca	12	418	0	430	2,356	.18
Eddy	3,058	2,771	1	5,930	4,167	1.42
Lea	7,664	3,447	1	11,112	4,392	2.53
Quay	1,521	1,755	1	3,277	2,875	1.14
Roosevelt	204	1,310	1	1,515	2,454	.62
ACQR 157 Upper Rio Grande Valley Intrastate						
Taos	1,046	1,327	2	2,375	2,256	1.05
ACQR 153 Las Cruces-Alamogordo Interstate						
Lincoln	157	1,003	5	1,165	4,858	.24
Otero	208	3,133	7	3,348	6,638	.50
ACQR 154 Northeastern Plains Interstate						
Colfax	202	1,252	4	1,458	3,764	.39
Guadalupe	40	1,432	2	1,474	2,998	.49
Harding	15	156	1	172	2,134	.08
Mora	136	474	1	611	1,940	.32
San Miguel	195	1,586	5	1,786	4,741	.38
Torrance	35	1,340	4	1,379	3,346	.41
Union	752	648	1	1,401	3,816	.37

3302

Source: 1978 Area and Point Source Emission Summary for State of New Mexico.

Table 2.1.2-10. Baseline CO emission levels in New Mexico

REGION/COUNTY	STATIONARY SOURCES TONS/YR	MOBILE SOURCES TONS/YR	NATURAL SOURCES TONS/YR	TOTAL TONS/YR	AREA OF COUNTY MI^2	DENSITY = TOTAL/AREA $TONS/YR/MI^2$
ACQR 155						
Pecos-Permian						
Basin Intrastate						
Chaves	553	19,413	0	19,964	6,084	3.28
Curry	465	15,867	0	16,332	1,403	11.64
De Baca	42	2,651	0	2,693	2,356	1.14
Eddy	5,384	16,214	39	21,637	4,617	5.19
Lea	931	20,092	20	21,043	4,392	.79
Quay	140	11,285	27	11,452	2,875	3.98
Roosevelt	194	7,079	47	7,320	2,454	2.98
ACQR 157						
Upper Rio Grande						
Valley Intrastate						
Taos	1,694	6,385	84	8,163	2,256	3.62
ACQR 153						
Las Cruces-						
Alamogordo						
Interstate						
Lincoln	117	6,327	181	6,625	4,858	1.36
Otero	2,291	16,843	246	19,380	6,638	2.92
ACQR 154						
Northeastern						
Plains Interstate						
Colfax	1,186	7,318	140	8,644	3,764	2.30
Guadalupe	335	9,094	56	9,485	2,998	3.16
Harding	85	811	40	936	2,134	.44
Mora	116	2,300	26	2,442	1,940	1.26
San Miguel	1,334	9,224	176	10,734	4,741	2.26
Torrance	86	8,351	125	8,562	3,346	2.56
Union	50	3,577	18	3,645	3,816	.96

3303

Source: 1978 Area and Point Source Emission Summary for State of New Mexico.

Table 2.1.2-11. Baseline HC emission levels in New Mexico

REGION/COUNTY	STATIONARY SOURCES TONS/YR	MOBILE SOURCES TONS/YR	NATURAL SOURCES TONS/YR	TOTAL TONS/YR	AREA OF COUNTY MI^2	DENSITY = TOTAL/AREA $TONS/YR/MI^2$
ACQR 115 Pecos-Permian Basin Intrastate						
Chaves	2,183	3,099	0	5,282	6,084	.87
Curry	878	3,016	0	3,894	1,403	2.78
De Baca	62	497	0	559	2,356	.24
Eddy	4,751	2,567	7	7,325	4,167	1.76
Lea	16,288	3,188	3	19,479	4,392	4.44
Quay	484	1,929	5	2,418	2,875	.84
Roosevelt	704	1,214	7	1,925	2,454	.78
ACQR 157 Upper Rio Grande Valley Intrastate						
Taos	1,096	1,112	14	2,222	2,256	.98
ACQR 153 Las Cruces-Alamogordo Interstate						
Lincoln	1,083	1,071	31	2,185	4,858	.45
Otero	1,215	4,042	42	5,299	6,638	.80
ACQR 154 Northeastern Plains Interstate						
Colfax	39	1,253	24	1,676	3,764	.45
Guadalupe	205	1,675	10	1,890	2,998	.63
Harding	71	151	7	229	2,134	.11
Mora	112	468	3	583	1,940	.30
San Miguel	613	1,581	30	2,224	4,741	.47
Torrance	599	1,549	21	2,169	3,346	.65
Union	207	631	3	841	3,816	.22

3304

Source: 1978 Area and Point Source Emission Summary for State of New Mexico.

Table 2.1.2-12. Texas SO_x emission inventory by AQCR*.

AQCR	STATIONARY SOURCES (TONS/YR)	MOBILE SOURCES (TONS/YR)	NATURAL SOURCES** (TONS/YR)	TOTAL (TONS/YR)
AQCR 211				
TOTAL	71,624	3,304	0	74,928
AREA	4,603	3,304	0	7,907
POINT	67,021	***	***	67,021

3374

* Data from 1975 National Emission Data System (NEDS) Report

** Forest fires are only emitters applicable to this category

*** Point source designation not applicable to this category

Table 2.1.2-13. Texas NO_x emission inventory by AQCR*.

AQCR	STATIONARY SOURCES (TONS/YR)	MOBILE SOURCES (TONS/YR)	NATURAL SOURCES** (TONS/YR)	TOTAL (TONS/YR)
AQCR 211				
TOTAL	88,891	51,432	0	140,323
AREA	3,051	51,432	0	54,483
POINT	85,840	***	***	85,840

3375

* Data from 1975 National Emission Data System (NEDS) Report

** Forest fires are only emitters applicable to this category

*** Point sources designation not applicable to this category

Table 2.1.2-14. Texas HC emission inventory by AQCR*.

AQCR	STATIONARY SOURCES (TONS/YR)	MOBILE SOURCES (TONS/YR)	NATURAL SOURCES** (TONS/YR)	TOTAL (TONS/YR)
AQCR 211				
TOTAL	96,710	55,326	0	156,036
AREA	1,570	55,326	0	56,896
POINT	95,140	***	***	95,140

3376

* Data from 1975 National Emission Data System (NEDS) Report

** Forest fires are only emitters applicable to this category

*** Point sources designation not applicable to this category

Table 2.1.2-15. Texas CO emission inventory by AQCR*.

AQCR	STATIONARY SOURCES (TONS/YR)	MOBILE SOURCES (TONS/YR)	NATURAL SOURCES** (TONS/YR)	TOTAL (TONS/YR)
AQCR 211				
TOTAL	799,495	300,648	0	1,100,143
AREA	4,335	300,648	0	304,983
POINT	795,160	***	***	795,160

3377

* Data from 1975 National Emission Data System (NEDS) Report

** Forest fires are only emitters applicable to this category

*** Point sources designation not applicable to this category

Table 2.1.2-16. Baseline gaseous emission levels in Texas.

COUNTY	NO_x (TONS/YR)	SO_2 (TONS/YR)	HC (TONS/YR)	CO (TONS/YR)
Bailey	—	—	9	27
Castro	691	—	1,316	1
Cochran	490	605	52	1
Dallam	—	—	—	—
Deaf Smith	279	35	59	174
Hale	3,651	3,022	2,573	26
Hartley	—	—	—	—
Hockley	4,538	2,581	475	3
Lamb	3,087	92	24	54
Lubbock	3,874	32	879	93
Moore	25,349	5,517	16,204	102,626
Oldham	—	—	—	—
Parmer	51	—	5	35
Potter	7,997	57,968	8,556	20,554
Randall	—	—	—	—
Sherman	—	—	—	—
Swisher	2	—	63	—

3306

Source: 1971 Point Source Inventory for State of Texas.

Figures 2.1.2-5 through 2.1.2-8 are presented for the Texas/New Mexico area to show the distribution of emissions levels of SO_x, NO_x, HC, and CO. Data for these figures were obtained from information in the 1977 EPA National Air Quality, Monitoring, and Emissions Trends Report.

Levels

National gaseous pollutant standards and state standards applicable in Texas and New Mexico are given in Table 2.1.2-17. Texas has not adopted any standards that are stricter than the NAAQS. New Mexico has gaseous pollutant standards that are stricter than the NAAQS for carbon monoxide, ozone, and sulfur dioxide.

There are no nonattainment areas for gaseous pollutants in the study area. (See Figure 2.1.2-3). The Class I areas in the study region were previously described and are shown in Figure 2.1.2-3. The rest of the study area has Class II status. The air pollutant increments for sulfur dioxide in Class I and Class II areas are given in Table 1-1. Class I and II increments for other gaseous pollutants are expected to be adopted by the EPA in the near future.

Figure 2.1.2-9 shows locations of gaseous pollutant levels measured in the New Mexico and Texas High Plains study region. Annual SO_2 values in the region are far below the annual standard. NO_2 values are approximately one-fourth of the annual standard. CO levels at Roswell, New Mexico, the only CO monitor in the region, are below the one- and eight-hour CO standards.

Point-Source Emissions

A description of the point-source inventory for counties in the Texas/New Mexico study region follows. Counties are presented alphabetically within each state with emissions for Texas described first.

Dallam County, Texas

There are four substantive point-sources of emissions, all particulates, in Dallam County: Conlen Grain, Conlen, Texas; Kerrick Elevator Company, Kerrick, Texas; Lind Mark Grain Company, Dalhart, Texas; and Texline Grain Company, Texline, Texas.

Potential fugitive dust sources within the county are from dry and irrigated cropland, and rangeland.

Sherman County, Texas

There are five substantive point-sources of emissions (particulates) in Sherman County: Freeman Feed Lot, Texhoma, Texas; Sherman County Grain Co., Texhoma, TX; Stratford Grain Co., Stratford, Texas; Texhoma Wheat Growers, Texhoma, Texas; and Walter Lasley and Sons, Stratford, Texas. Potential fugitive dust sources within the county are irrigated cropland and rangeland.

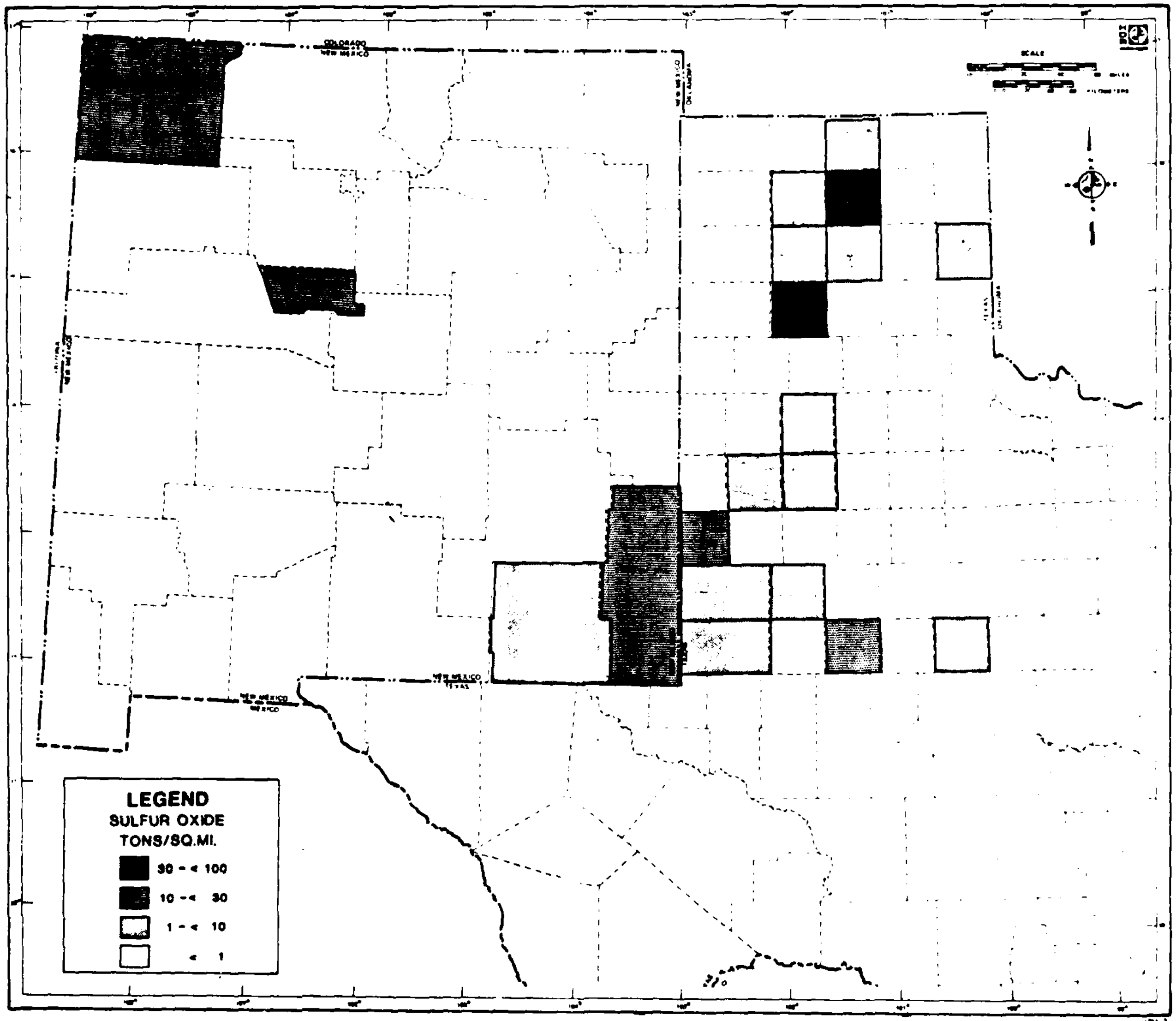

Figure 2.1.2-5. Sulfur oxide levels in the Texas/New Mexico study area and vicinity.

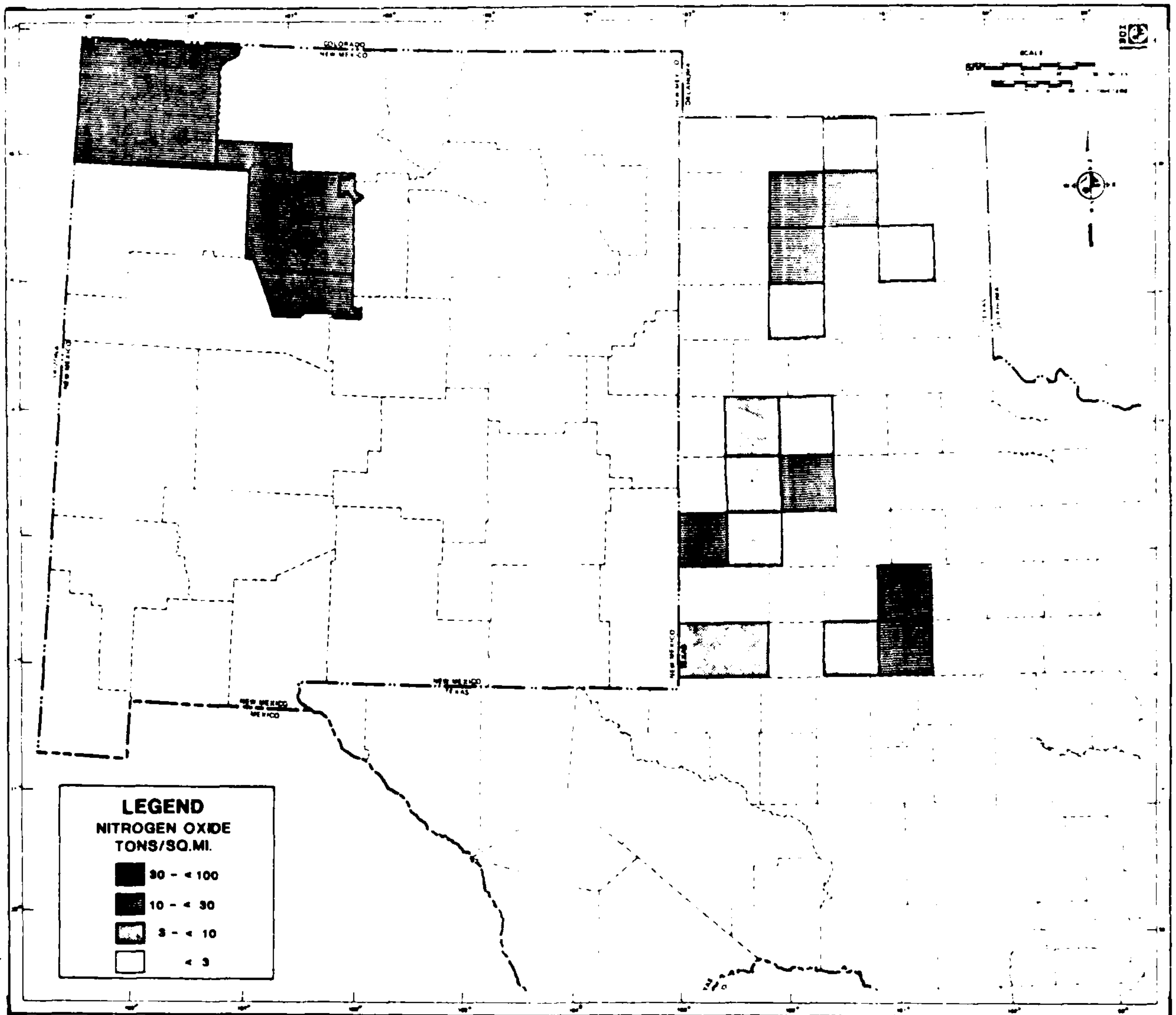

Figure 2.1.2-6. Nitrogen oxide levels in the Texas/New Mexico study area and vicinity.

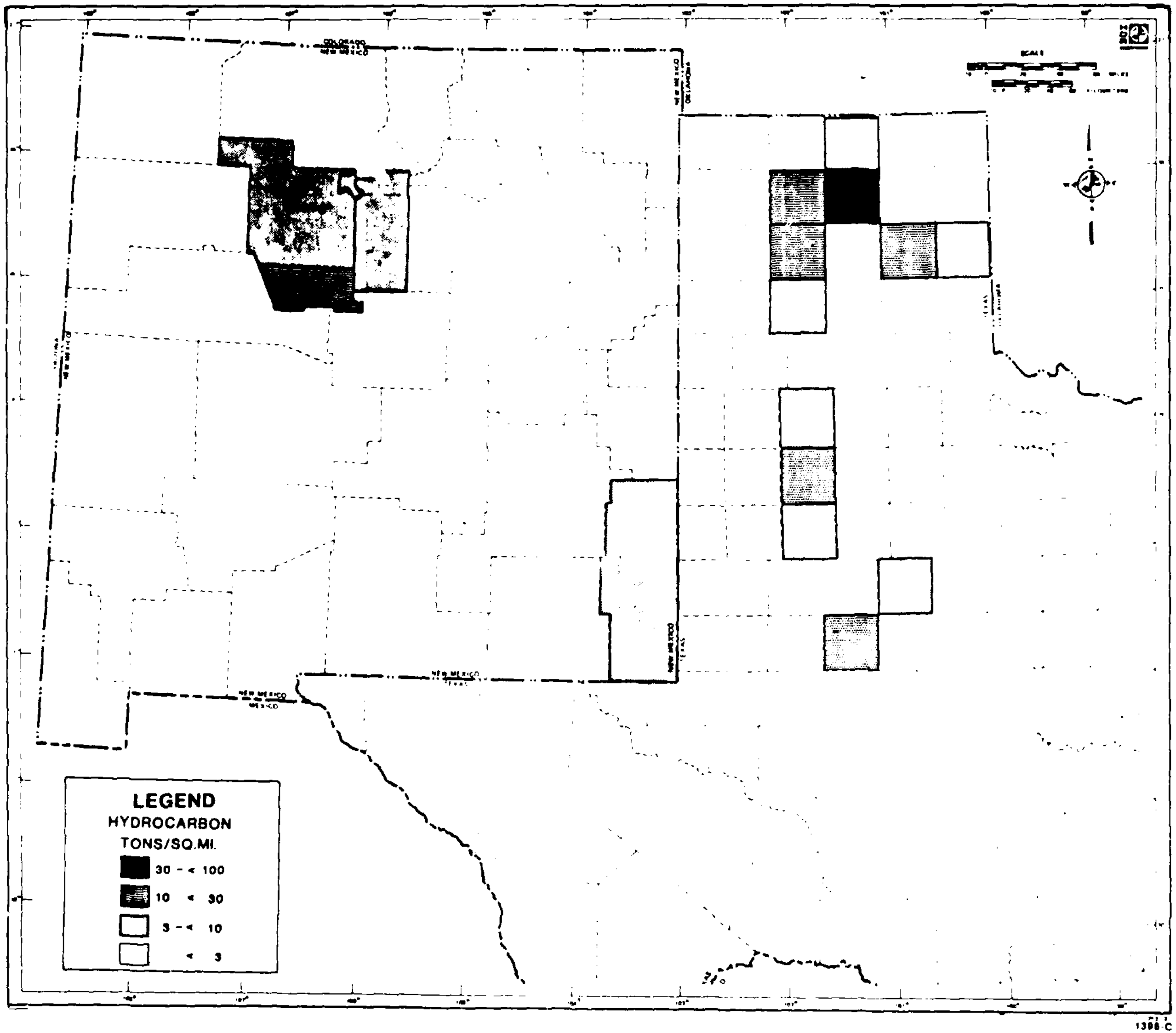

Figure 2.1.2-7. Hydrocarbon levels in the Texas/New Mexico study area and vicinity.

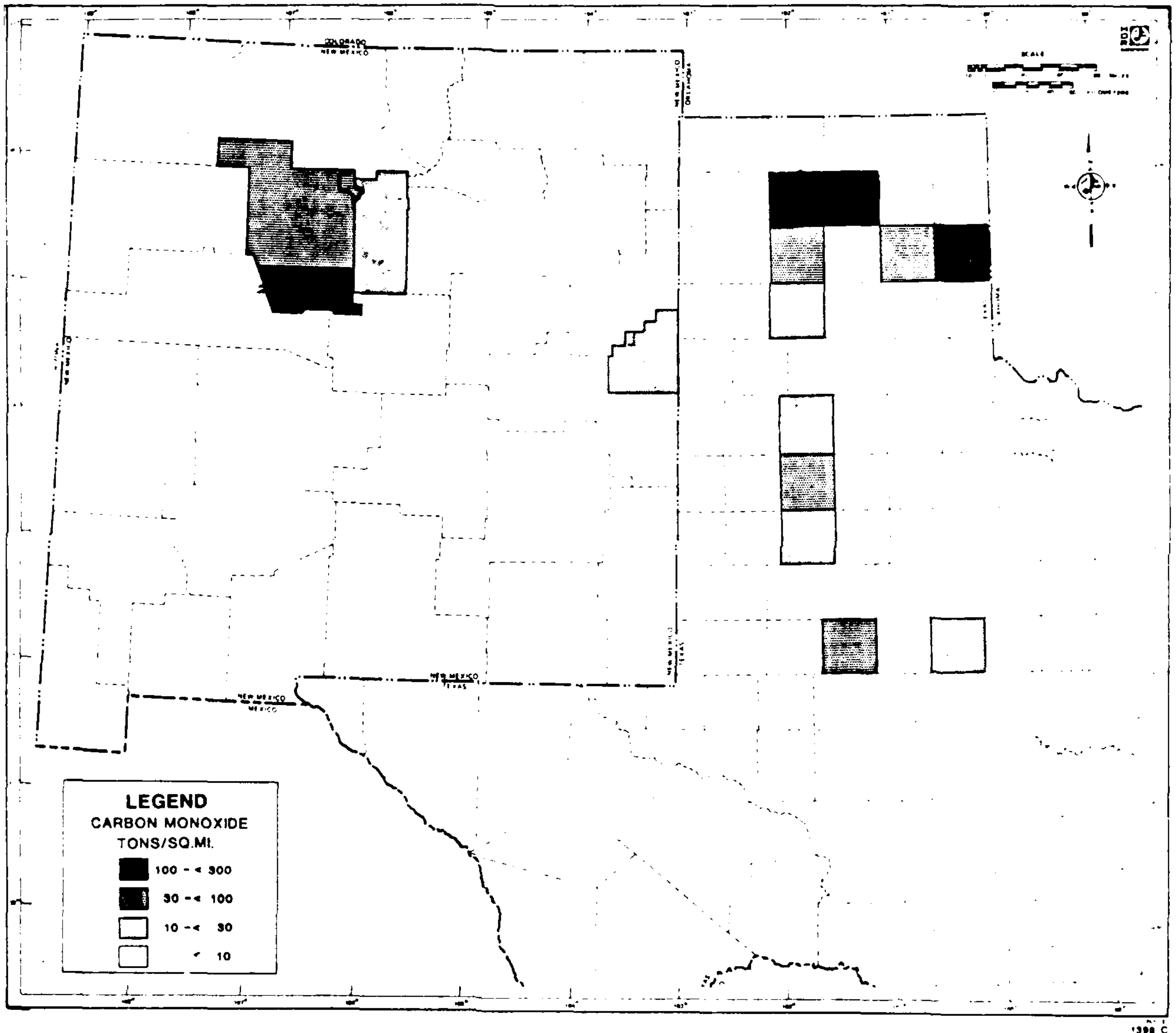

Figure 2.1.2-8. Carbon monoxide levels in the Texas/New Mexico study area and vicinity.

Table 2.1.2-17. Summary of national ambient air quality standards (NAAQS) and New Mexico and Texas ambient air quality standards for gaseous pollutants.

POLLUTANT	AVERAGING TIME	NAAQS		TEXAS STANDARDS	NEW MEXICO STANDARDS
		PRIMARY	SECONDARY		
Carbon Monoxide	8-hour[1]	10 mg/m³ (9 ppm)	Same as primary standard	Same as NAAQS	9.7 mg/m³ (8.7 ppm)
	1-hour[1]	40 mg/m³ (35 ppm)			15 mg/m³ (13.1 ppm)
Carbon Monoxide above 5,000 ft MSL	8-hour[1]	10 mg/m³ (9 ppm)			
	1-hour[1]	40 mg/m³ (35 ppm)			
Ozone	1-hour[2]	235 μg/m³ (0.12 ppm)	Same as primary standard	Same as NAAQS	118 μg/m³ (0.06 ppm)
Nitrogen Dioxide	Annual (Arithmetic Mean)	100 μg/m³ (0.05 ppm)	Same as primary standard	Same as NAAQS	
Hydrocarbons (Corrected for Methane)	3-hour (6-9 a.m.)	160 μg/m³ (0.24 ppm)	Same as primary standard	Same as NAAQS	
Sulfur Dioxide	Annual (Arithmetic Mean)	80 μg/m³ (0.03 ppm	Same as primary standard	Same as NAAQS	52 μg/m³ (0.02 ppm)
	24-hour[1]	365 μg/m³ (0.14 ppm)			260 μg/m³ (0.10 ppm)
	3-hour[1]	none	1,300 μg/m³ (0.5 ppm)		Same as NAAQS

1376

[1]Not to be exceeded more than once per year.

[2]The ozone standard is attained when the expected number of days per calendar year with a maximum hourly average concentration above the standard is equal to or less than one.

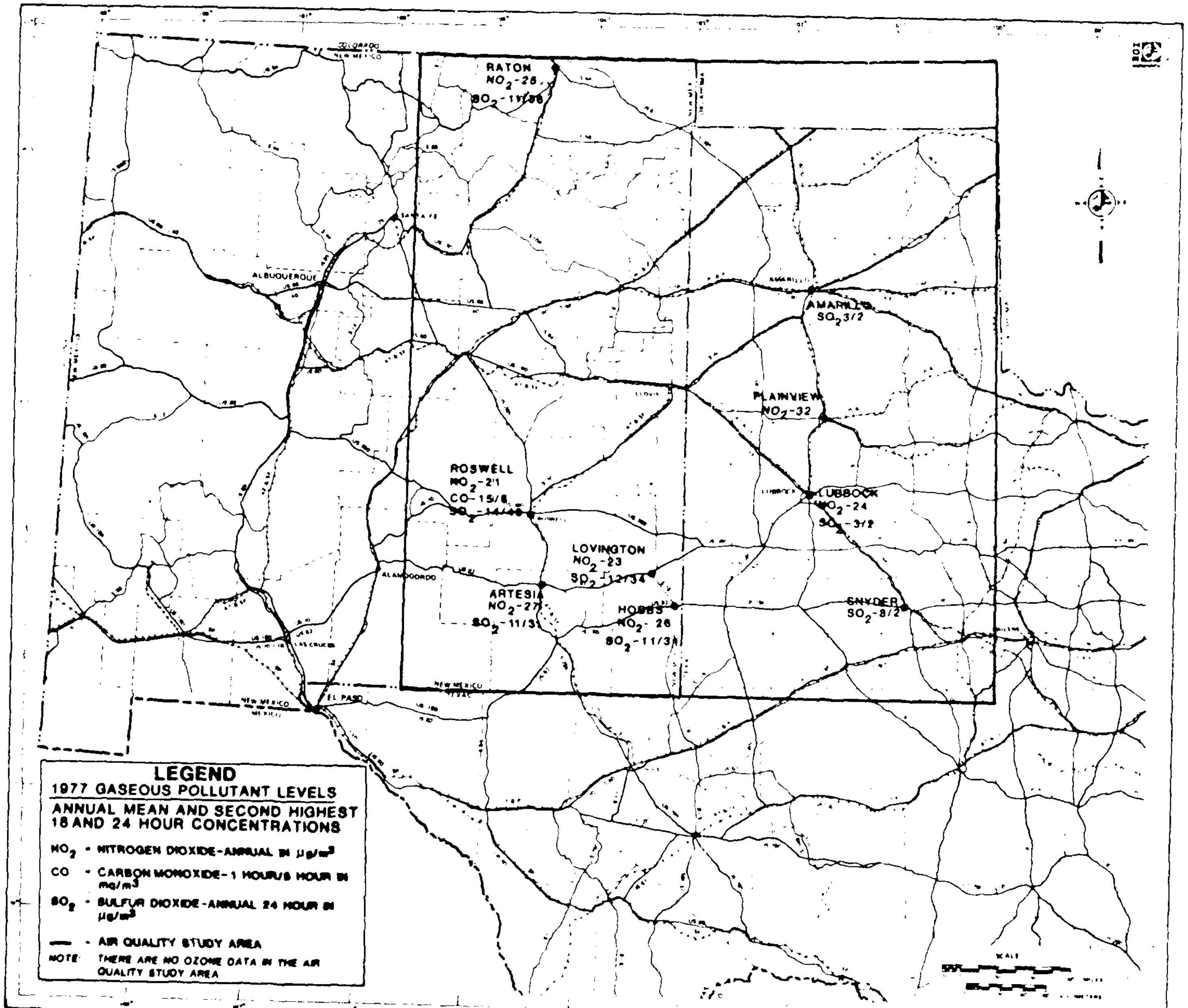

Figure 2.1.2-9. Gaseous pollutant levels in the Texas/New Mexico study area.

Hartley County, Texas

There are four substantive point-sources of emissions (particulates) in Hartley County: Dalhart Consumers Fuel Association, Dalhart, Texas; Farmers Supply Company, Hartley, Texas; Thompson Grain and Fertilizer, Texas; and XIT Feed-yards, Dalhart, Texas.

Potential fugitive dust sources within the County are from irrigated cropland and rangeland.

Moore County, Texas

There are 29 substantive point-sources of emissions in Moore County. These are listed in Table 2.1.2-18.

Potter County, Texas

There are 19 substantive point-sources of emissions in Potter County (Table 2.1.2-19). Potential fugitive dust sources are dry cropland and rangeland about 40 mi east of the county.

Oldham County, Texas

There are five substantive point-sources of emissions (particulates) in Oldham County: Adrian Wheat Growers, Adrian; American Grain and Cattle Co., Vega; American Grain and Cattle Co., Wildorado; and Wildorado Producers Assn., Wildorado. Potential fugitive dust sources within the county are irrigated cropland and rangeland.

Deaf Smith County, Texas

Table 2.1.2-20 lists the 15 substantive point-sources of emissions in Deaf Smith County. Potential fugitive dust sources are irrigated cropland within the county and rangeland.

Randall County, Texas

There are four substantive point-sources of emissions (all particulates) in the county: Consumers Fuel Association, 6 mi. north of Happy, Texas; Consumers Fuel Association, Canyon, Texas; Kind Elevator and Storage, Amarillo, Texas and Western Beef Grain Co. Potential fugitive dust sources within the county are irrigated cropland and rangeland.

Parmer County, Texas

There are 16 substantive point sources of emissions in Parmer County (Table 2.1.2-21).

Castro County, Texas

Potential fugitive dust sources within the county are irrigated cropland and rangeland. Point sources are listed in Table 2.1.2-22.

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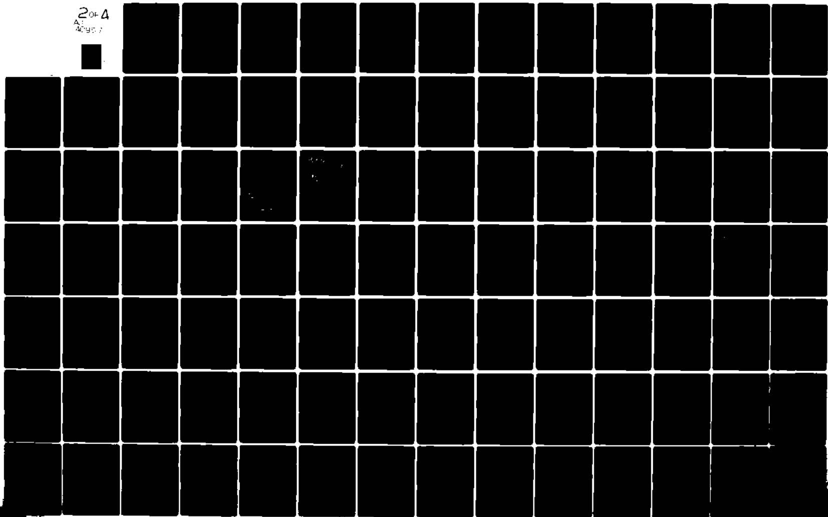

Table 2.1.2-18. Point sources of emissions in Moore County, Texas.

SOURCE	LOCATION RELATIVE TO PROJECT	POLLUTANT
Colorado Interstate Corp.	Masterson, Texas, 25 mi SSE	Particulates, SO_x, NO_x, HC, CO
Colorado Interstate Corp.	Fritch, Texas, 35 mi SE	Particulates, NO_x, HC, CO
Continental Carbon	6 mi NE Dumas, Texas, 8 mi E	Particulates, SO_x, NO_x, HC, CO
Continental Grain Co.	11 mi E of Sunray, Texas, 25 mi E	Particulates
Continental Grain Co.	Etter, Texas, 2 mi NE	Particulates
Continental Grair Co.	Sunray, Texas, 15 mi E	Particulates
Diamond Shamrock Oil & Gas	10 mi NE Dumas, Texas, 15 mi E	Particulates, SO_x, NO_x, HC, CO
Dumas Co-op Elevator	15 mi ENE of Dumas, Texas, 25 mi E	Particulates
Dumas Co-op Elevator	Dumas, Texas, 8 mi SE	Particulates
El Paso Natural Gas	4 mi SW Dumas, Texas, 6 mi SSE	HC, NO_x
Etter Feed and Grain Co.	12 mi N of Dumas, Texas, 10 mi E	Particulates
Farmers Grain Co. Elevator	2 mi S of Etter, Texas, 2 mi E	Particulates
Farmers Grain Co. Elevator	5 mi N of Dumas, Texas, 5 mi E	Particulates
Kerr-McGee Corp.	Cactus, Texas, 3 mi NE	Particulates, NO_x, HC, CO
Moore County Grain Handling Co.	Dumas, Texas, 8 mi SE	Particulates
Natural Gas Pipeline	15 mi E of Dumas, Texas, 22 mi ESE	NO_x, HC
Hawthorn Natural Gas Co.	Sunray, Texas, 12 mi ENE	NO_x, HC
Panhandle Eastern Pipeline	8 mi SSW of Sunray, Texas, 15 mi E	NO_x, HC
Panhandle Eastern Pipeline	20 mi E of Dumas, Texas, 27 mi ESE	SO_x, NO_x, HC
Phillips Petroleum Co.	20 mi E of Dumas, Texas, 27 mi ESE	Particulates, SO_x, NO_x, HC, CO
Phillips Petroleum Co.	Cactus, Texas, 3 mi NE	Particulates, SO_x, NO_x, HC, CO
Phillips Petroleum Co.	5 mi SW of Dumas, Texas, 7 mi SSE	Particulates, SO_x, NO_x, HC, CO
Potash Company of America	6 mi NE of Dumas, Texas, 8 mi E	Particulates, SO_x, NO_x
Southwestern Public Service Co.	Sunray, Texas, 12 mi ENE	Particulates, SO_x, NO_x, HC, CO
Sunray Co-op	Sunray, Texas, 12 mi ENE	Particulates
Texas Sulfur Products	11 mi W of Stinnett, Texas, 40 mi SE	SO_x
Texas Sulfur Products	5 mi SW of Dumas, Texas, 7 mi SSE	Particulates, SO_x, HC
U.S. Bureau of Mines Helium Operation	Masterson, Texas, 25 mi SSE	Particulates, SO_x, NO_x, HC

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Table 2.1.2-19. Point sources of emissions in Potter County, Texas.

SOURCE	LOCATION RELATIVE TO PROJECT	POLLUTANT
Acco Feeds	Amarillo, <30 mi	Particulates
Amarillo Municipal Incinerator	Amarillo, <30 mi	Particulates, SO_x, NO_x, HC, CO
American Smelting & Refining	Amarillo, <30 mi	Particulates, SO_x, NO_x, HC, CO
Attebury Elevator	Amarillo, <30 mi	Particulates
Bell Helicopter	Amarillo, <30 mi	Particulates, NO_x, HC
Bushland Grain Co-op	Bushland, 14 mi NE	Particulates
Gilvin-Terrill, Inc.	Lakeside, <30 mi	Particulates, NO_x
Globe Foundry & Machine Co.	Amarillo, <30 mi	Particulates, SO_x, CO
H. J. Hughes Grain Elevator	Panhandle, <30 mi	Particulates
Haywood, Inc.	Amarillo, <30 mi	Particulates, HC
Milligan, J. Lee, Inc.	30 mi N of Amarillo, <50 mi	Particulates
Milligan, J. Lee, Inc.	Amarillo, <30 mi	Particulates, NO_x
Palo Duro Grain Co.	Amarillo, <30 mi	Particulates
Pioneer Gas Products	5 mi S of Fritch, 24 mi SE	Particulates, SO_x, NO_x, HC
Pioneer Gas Products	25 mi N of Amarillo, <50 mi	Particulates, SO_x, NO_x, HC, CO
Producers Grain Corp.	Amarillo, <30 mi	Particulates
Southwestern Portland Cement	Bushland, 14 mi NE	Particulates, NO_x, SO_x
Southwestern Public Service	Amarillo, <30 mi	Particulates, SO_x, NO_x, HC, CO
Texaco Inc.	Amarillo, <30 mi	Particulates, SO_x, NO_x, HC, CO

2414

Table 2.1.2-20. Point sources of emissions in Deaf Smith County.

SOURCE	LOCATION RELATIVE TO PROJECT	POLLUTANT
Armour & Co	4 mi W of Hereford, <4 mi	Particulates
Big-Tex Cattle & Grain	Hereford, <8 mi	Particulates
Continental Grain Co.	Hereford, <8 mi	Particulates
Dawn Coop.	Dawn, 2 mi SE	Particulates
Farmers Eelv.	Dawn, 2 mi SE	Particulates
Ford Fertilizer & Simmons Petroleum	12 mi S of Adrian, in it	Particulates
Ford Fertilizer & Simmons Petroleum	10 mi S of Vega, in it	Particulates
Hereford Grain Corp.	Hereford, <8 mi	Particulates
City of Hereford	Hereford, <8 mi	Particulates, SO_x, NO_x, HC, CO
Holly Sugar Corp	2 mi W of Hereford, <8 mi	Particulates, SO_x, NO_x, HC, CO
Pitman Easley Industries	Hereford, <8mi	Particulates
Pitman Grain Co.	8 mi W of Hereford, <5 mi	Particulates
Pitman Grain Co.	Hereford, <8 mi	Particulates
Pitman Grain Co.	22 mi NW of Hereford, in it	Particulates
Pitman Grain Co.	9 mi NW of Hereford, in it	Particulates

2412

Table 2.1.2-21. Point sources of emissions in Parmer County, Texas.

SOURCE	LOCATION RELATIVE TO PROJECT	POLLUTANT
Big Texas Cattle & Grain	2 mi w of Summerfield, Texas, <5 mi	Particulates
Bovina Wheat Growers	Bovina, Texas, 5 mi W	Particulates
Bruegel & Sons	Near Black, Texas, <5 mi	Particulates
Cooper Gin	Farwell, Texas, 12 mi W	Particulates, HC, CO
Friona Industries	Black, Texas, <5 mi	Particulates
Friona Industries	Friona, Texas, <5 mi	Particulates
Friona Wheat Growers	Friona, Texas <5 mi	Particulates
Hub Grain Co.	9 mi S of Friona, Texas, <5 mi	Particulates
Missouri Beef Packers	3 mi W of Friona, Texas, <5 mi	Particulates, NO_x
Sherley Grain Co.	Bovina, Texas, 5 mi W	Particulates
Sherley-Anderson-Pitman, Inc.	Farwell, Texas, 12 mi W	Particulates
Texas Products, Inc.	Farwell, Texas, 12 mi W	Particulates
Tri-County Elevator Co.	Black, Texas, <5 mi	Particulates
West Friona Grain	2 mi SW of Friona, Texas, <5 mi	Particulates
Worley Mills, Inc.	Farwell, Texas, 12 mi W	Particulates

2413

Table 2.1.2-22. Point sources of emissions in Castro County.

SOURCE	LOCATION RELATIVE TO PROJECT	POLLUTANT
American Grain & Cattle	Hart, Texas, 20 mi SE	Particulates
American Grain & Sales	Happy, Texas, 5 mi E	Particulates
Bruegel & Sons	Dimmitt, Texas, <2 mi	Particulates
Castro County Grain Co.	Dimmitt, Texas, <2 mi	Particulates
Agri Industries	Dimmitt, Texas, <2 mi	Particulates
Eastern Grain Inc.	Hereford, Texas, 12 mi S	Particulates
Farmers Grain Co.	Hart, Texas, 20 mi SE	Particulates
Flagg Grain Co.	Dimmitt, Texas, 12 mi SW	Particulates
Grain Handling Corp.	Hart, Texas, 22 mi SE	Particulates
Roy Grain Co.	Hart, Texas, 12 mi SE	Particulates
W & C Grain Inc.	Dimmitt, Texas, <2 mi	Particulates
Western Ammonia Corp.	Dimmitt, Texas, <2 mi	Particulates, NO_x, HC, CO

2430

Swisher County, Texas

Substantive point-sources in Swisher County are listed in Table 2.1.2-23.

Bailey County, Texas

Potential fugitive dust sources within the county are dry cropland, irrigated cropland and rangeland. Substantive point-sources in the county are shown in Table 2.1.2-24.

Lamb County, Texas

Potential fugitive dust sources within the County are dry cropland, irrigated cropland and rangeland. Substantive emission point-sources are listed in Table 2.1.2-25.

Hale County, Texas

Substantive emission po... -sources are listed in Table 2.1.2-26.

Cochran County, Texas

There are three major point-sources of emissions in Cochran County: Beseda and Son Elevator, Inc. (particulates), located at Lehman, Texas; Cities Service Oil Co. (particulates, SO_x NO_x, HC, and CO), located at Lehman, Texas; and at Cochran County Grain Co. (particulates), at Morton, Texas. Potential fugitive dust sources within the county are from dry and irrigated cropland and rangeland.

Hockley County, Texas

The potential fugitive dust source within the county is from rangeland. Substantive point-emission sources are listed in Table 2.1.2-27.

Lubbock County, Texas

Potential fugitive dust sources within the County are from dry and irrigated cropland. Substantive emission point-sources are given in Table 2.1.2-28.

Quay County, New Mexico

The three major point-sources of emissions in Quay County are: Aroce Const., Tucumcari, New Mexico, (particulates); Tucumcari Municipal P&L, Tucumcari, New Mexico, (particulates, SO_x, NO_x, CO, and HC); and New Mexico Highway Dept., Las Vegas, New Mexico, with (particulates). The potential fugitive dust sources within the county are from dry and irrigated cropland and rangeland.

Union County, New Mexico

The one substantive point-source of emissions in Union County is Municipal Generating Station, 10 mi west of Clayton, New Mexico (particulates SO_x, NO_x, CO, and HC). Potential fugitive dust sources within the county are: dry and irrigated cropland, and rangeland.

Table 2.1.2-23. Point sources of emissions in Swisher County, Texas.

SOURCE	LOCATION RELATIVE TO PROJECT	POLLUTANT
BFW Grain Co.	Kress, Texas, 25 mi SE	Particulates
Harmon-Toles Grain & Seed Co.	Happy, Texas, 5 mi E	Particulates
Hipp, Inc.	Tulia, Texas, 10 mi ESE	Particulates
Houston Elevator	6 mi S of Tulia, Texas, 14 mi SE	Particulates
Kress Farmers Elevator	Kress, Texas, 25 mi SE	Particulates
Lone Star Elevator	Happy, Texas, 5 mi E	Particulates
Prairie Grain Co.	Tulia, Texas, 10 mi ESE	Particulates
Roll-A-Cone Mfg. & Dist.	6 mi NE of Tulia, Texas, 13 mi E	Particulates, NO_x, HC
Swisher County Cattle Co.	9 mi NW of Tulia, Texas, 1 mi E	Particulates
Taylor-Evans Seed	Tulia, Texas, 10 mi ESE	Particulates
Tulia Feedlot, Inc.	4 mi S of Tulia, Texas, 13 mi SE	Particulates
Tulia Feedlot, Inc.	9 mi SE of Tulia, Texas, 17 mi SE	Particulates
Tulia Feedlot, Inc.	Tulia, Texas, 10 mi ESE	Particulates
Tulia Grain Terminal	Tulia, Texas, 10 mi ESE	Particulates
Tulia Wheat Growers	Tulia, Texas, 10 mi ESE	Particulates
Tulia Wheat Growers	7 mi N of Tulia, Texas, 10 mi E	Particulates

2415

Table 2.1.2-24. Point sources of emissions in Bailey County.

SOURCE	LOCATION RELATIVE TO PROJECT	POLLUTANT
Beck Gin Co.	Muleshoe, Texas, 6 mi W	Particulates
Farmers Co-op Elevator	Muleshoe, Texas, 6 mi W	Particulates
Griffiths, Ray & Sons.	Muleshoe, Texas, 6 mi W	Particulates
King Grain Co.	Muleshoe, Texas, 6 mi W	Particulates
Paris Milling Co.	Muleshoe, Texas, 6 mi W	Particulates
Stegall Gin	Goodland, Texas	Particulates, CO, HC
Texas Sesame	West Muleshoe, Texas, 6 mi W	Particulates

2431

Table 2.1.2-25. Point sources of emissions in Lamb County, Texas.

SOURCE	LOCATION RELATIVE TO PROJECT	POLLUTANT
Beck Gin	Sudan, Texas, 2 mi E	Particulates
Byers Grain & Feed	Littlefield, Texas, 16 mi E	Particulates
Cone Elevator of Amherst	Amherst, Texas, 6 mi E	Particulates
Earth Elevator	Earth, Texas, 4 mi E	Particulates
Farmers Grain Co.	Littlefield, Texas, 16 mi E	Particulates
Feeders Grain, Inc.	Sudan, Texas, 2 mi E	Particulates
Goodpasture, Inc.	Littlefield, Texas, 16 mi E	Particulates
High Plains Grain Co.	Olton, Texas, 20 mi E	Particulates
Jake Diel Dirt & Paving	Littlefield, Texas, 16 mi E	Particulates
Littlefield Farmers Co-op of Gin	Littlefield, Texas, 16 mi E	Particulates, SO_x, NO_x, HC, CO
Littlefield Farmers Co-op Elev.	Littlefield, Texas, 16 mi E	Particulates
Olton Grain Co-op, Inc.	Olton, Texas, 20 mi E	Particulates
R & S Grain, Inc.	Olton, Texas, 20 mi E	Particulates
Southwestern Public Service Co.	Earth, Texas, 4 mi E	Particulates, SO_x, NO_x, HC, CO
Springlake Grain	Springlake, Texas, 10 mi E	Particulates
Sudan Livestock & Feeding Co.	Sudan, Texas, 2 mi E	Particulates
Tide Products, Inc.	Littlefield, Texas, 16 mi E	Particulates
Toro Grain	Spade, Texas, 28 mi E	Particulates
Toro Grain Co.	Olton, Texas, 20 mi E	Particulates

2422

Table 2.1.2-26. Point sources of emissions in Hale County, Texas.

SOURCE	LOCATION RELATIVE TO PROJECT	POLLUTANT
Amoco Production Co.	Levelland, Texas, 14 mi SE	Particulates, SO_x, NO_x, HC
Big State Grain Co.	Abernathy, Texas, 42 mi E	Particulates
Blue Star Elevator & Storage	Petersburg, Texas, 52 mi E	Particulates
Conlee Seed Co.	Plainview, Texas, 52 mi E	Particulates
Cotton Center Grain Co.	Cotton Center, Texas, 30 mi E	Particulates
County Line Co-op Gin	Abernathy, Texas, 42 mi E	Particulates
East Mound Gin	Plainview, Texas, 52 mi E	Particulates
Farmers Gin of Edmonson	Edmonson, Texas, 36 mi E	Particulates
Hale Center Wheat Growers	Hale Center, Texas, 40 mi E	Particulates
Halfway Co-op Gin	Plainview, Texas, 52 mi E	Particulates, CO, HC
Harvest Queen Mill & Elevator	Plainview, Texas, 52 mi E	Particulates
Heard Elevator	Petersburg, Texas, 52 mi E	Particulates
Mayfield Co-op Gin	Hale Center, Texas, 40 mi E	Particulates
Midwest	Plainview, Texas, 52 mi E	Particulates
National Alfalfa Dehydrating and Milling Co.	Plainview, Texas, 52 mi E	Particulates
Occidental Chemical Co. of Texas	Plainview, Texas, 52 mi E	Particulates, SO_x, NO_x, HC, CO
Paymaster Gin	Plainview, Texas, 52 mi E	Particulates, HC, CO
Petersburg Co-op Grain Co.	Petersburg, Texas, 52 mi E	Particulates
Plainsman Elevators	Plainview, Texas, 52 mi E	Particulates
Producers Grain Corp.	Plainview, Texas, 52 mi E	Particulates
Service Grain Co.	Abernathy, Texas, 42 mi E	Particulates
Southwestern Grain, Inc.	Plainview, Texas, 52 mi E	Particulates
United Farm Industries	Plainview, Texas, 52 mi E	Particulates

2424

Table 2.1.2-27. Point sources of emissions in Hockley County, Texas.

SOURCE	LOCATION RELATIVE TO PROJECT	POLLUTANT
Amoco Production Co.	Levelland, Texas, 16 mi SE	Particulates, SO_x, NO_x, HC, CO
Amoco Production Co.	Brownfield, Texas, 40 mi SSE	Particulates, SO_x, NO_x, HC, CO
Anderson Grain Co.	Levelland, Texas, 16 mi SE	Particulates
Anton Producers Co-op	Anton, Texas, 26 Mi E	Particulates
Farmers Co-op Elevator	Levelland, Texas, 16 mi SE	Particulates
Lemco Industries	Levelland, Texas, 16 mi SE	Particulates
Texas-New Mexico Pipeline Co.	Sundown, Texas, 18 mi S	HC

2416

Table 2.1.2-28. Point sources of emissions in Lubbock County, Texas.

SOURCE	LOCATION RELATIVE TO PROJECT	POLLUTANT
Anderson Clayton	Lubbock, Texas, 40 mi ESE	Particulates, NO_x, HC
Cone Elevator of Lubbock	Lubbock, Texas, 40 mi ESE	Particulates
Economy Mills	Lubbock, Texas, 40 mi ESE	Particulates
Godbold, Inc.	Lubbock, Texas	Particulates
Goodpasture, Inc.	Lubbock, Texas	Particulates
Grimmell Fire Protection System	Lubbock, Texas	NO_x
Liberty Co-op Gin	Lubbock, Texas	Particulates
Lubbock Cotton Oil Co.	Lubbock, Texas, 40 mi ESE	Particulates, NO_x, HC
Lubbock Feed Lots	Lubbock, Texas, 40 mi ESE	Particulates
Lubbock Gin Co.	Lubbock, Texas, 40 mi ESE	Particulates
Lubbock Mfg, Co.	Lubbock, Texas, 40 mi ESE	Particulates, NO_x, CO, HC
Lubbock Power & Light	Lubbock, Texas, 40 mi ESE	Particulates, SO_x, NO_x, HC, CO
Nabro Corp.	Lubbock, Texas, 40 mi ESE	HC
Ralston Purina Co.	Lubbock, Texas, 40 mi ESE	Particulates
J. W. Rust Grain Co.	Lorenzo, Texas, 40 mi ESE	Particulates
Southwestern Public Service Co.	Lubbock, Texas, 40 mi ESE	Particulates, SO_x, NO_x, HC, CO
Tatum Bros. Grain, Inc.	Lubbock, Texas, 40 mi ESE	Particulates
Texaco, Inc.	Lubbock, Texas, 40 mi ESE	HC
Trumbul Asphalt Co. of Delaware	Lubbock, Texas, 40 mi ESE	Particulates, NO_x, HC, CO
Wards Mill & Elevator	Adalon, Texas, 50 mi E	Particulates
Western Pavers	Lubbock, Texas, 40 mi ESE	Particulates
Williams & Peters Construction Co.	Lubbock, Texas, 40 mi ESE	Particulates

2428

Harding County, New Mexico

Rangeland is the potential fugitive dust source within the county.

Guadalupe County, New Mexico

The one substantive point-source of emissions in Guadalupe County is the Santa Rosa Dump, 30 mi northwest of Santa Rosa, New Mexico (particulates and SO_x). The potential fugitive dust source within the county is from rangeland 10 mi. (26 km) northwest of the project.

Curry County, New Mexico

The three major point-sources of emissions in Curry County are: K. Barrett & Sons, Clovis, New Mexico, (particulates); Eastwood Construction, Clovis, New Mexico, (particulates); and Jake Diel Dirt & Paving, Clovis, New Mexico, (particulates).

Potential fugitive dust sources within the county are from dry and irrigated cropland, and rangeland.

De Baca County, New Mexico

The one substantive point-source of emissions in De Baca County is Sam Sanders, Inc., emitting particulates. Potential fugitive dust sources within the county are from dry cropland and rangeland.

Roosevelt County, New Mexico

The five substantive point-sources of emissions in Roosevelt County are Cities Service Oil, (particulates SO_x, NO_x, HC and CO); Cities Service, Chauerog Station, (particulates NO_x, HC and CO); Cities Service, E. Bluitt Station, (particulates NO_x, HC and CO); Cities Service, Todd Station, (particulates NO_x, HC and CO); and Warren Petroleum Co., Bough 153 Station, (particulates NO_x, HC and CO). The potential fugitive dust sources within the county are dry cropland, irrigated cropland and rangeland.

Lea County, New Mexico

Potential fugitive dust sources within the county are from irrigated cropland and rangeland. Substantive emission point-sources are shown in Table 2.1.2-29.

Chaves County, New Mexico

Potential fugitive dust sources within the county are irrigated cropland and rangeland. Substantive point-source emissions in Chaves County are listed in Table 2.1.2-30.

Visibility

Federal Land Managers have defined the status of visibility impairment in Class I areas as well as the potential sources of this impairment. The status of regions corresponding to the Texas/New Mexico siting area is summarized in Table 2.1.2-31. Visibility restrictions in the Texas/New Mexico region are mainly related

Table 2.1.2-29. Point sources of emissions in Lea County, New Mexico.

SOURCE	LOCATION RELATIVE TO PROJECT	POLLUTANT
Amoco Production Co.		HC
Arco Pecos		HC
Climax Chemical Co.	Monument, New Mexico, 50 mi SE	Particulates, SO_x
Continental Oil		Particulates, NO_x, HC
El Paso National Gas	Eunice, New Mexico, 65 mi SE	Particulates, SO_x, NO_x, HC
El Paso Natural Gas	17 stations scattered throughout the county	Particulates, SO_x, NO_x, HC, CO
Exxon	Hobbs, New Mexico, 50 mi SE	HC
Lea County Elec. Co-op	Lovington, New Mexico, 35 mi ESE	Particulates, SO_x, NO_x, HC
Mobil Oil	3 stations in county	Particulates, NO_x, HC
Northern Natural Gas Co.	8 sites in county	Particulates, SO_x, NO_x, HC
Percy Gas Processors	Antelope Ridge, New Mexico, 50 mi SSE	SO_x
Phillips Petroleum	5 sites in county	Particulates, NO_x, SO_x, HC
Shell Oil Co.	Hobbs, New Mexico, 50 mi SE	HC
Skelly Oil Co.	Eunice, New Mexico, 65 mi SE	Particulates, SO_x, NO_x, HC
Southwestern Public Service	Hobbs, New Mexico, 50 mi SE	Particulates, SO_x, NO_x, HC
Texaco	Buckeye, New Mexico, 30 mi SE	Particulates, SO_x, NO_x, HC
Thomason Construction	Hobbs, New Mexico, 50 mi SE	Particulates
Wallach Concrete Products	Hobbs, New Mexico, 50 mi SE	Particulates
Warren Petroleum Co.	10 sites in county	Particulates, SO_x, NO_x, HC
Brunson and McKnight	Hobbs, New Mexico, 50 mi SE	HC

2423

Table 2.1.2-30. Substantial point sources of emissions in Chaves County.

SOURCE	LOCATION RELATIVE TO PROJECT	POLLUTANT
Armstrong & Armstrong	Roswell, New Mexico, 20 mi W	Particulates
Cities Service	Cato Station, New Mexico	Particulates, NO_x, HC, CO
City of Roswell	Roswell, New Mexico, 20 mi W	Particulates
El Paso Natural Gas	Roswell, New Mexico, 20 mi W	Particulates, NO_x, HC, CO
Farmers Co-op	Hagerman, New Mexico, 15 mi SW	Particulates
Farmers Co-op	Dexter, New Mexico, 15 mi SW	Particulates
Southwestern Public Service	Roswell, New Mexico, 20 mi W	Particulates, SO_x, NO_x, HC
New Mexico State Highway Dept.	Roswell, New Mexico	Particulates
Transwestern Pipeline	Station No. 9, New Mexico	Particulates, NO_x, HC, CO

2427

Table 2.1.2-31. Status of class visibility impairment in M-X siting region.

REGION	REPORTED VISIBILITY STATUS	OBSERVED VISIBILITY PHENOMENA	POTENTIAL SOURCES		POTENTIAL FUTURE IMPAIRMENT
			MAN MADE	NATURAL	
Eastern New Mexico Western Texas	Generally desirable visibility; Need to assess noted	1. Haze 2. Dust 3. Smoke	1. Smelters 2. Agricultural Activities 3. Prescribed Burning	1. Natural Haze 2. Windblown Dust	Possible decrease in smelter impacts. Increased general development.

745-2

to natural haze and windblown dust. Both Texas and New Mexico have some form of visible emission standard; however, these regulations generally apply only to smoke or combustion related sources.

2.2 FUTURE AIR QUALITY ENVIRONMENT WITHOUT THE M-X

NEVADA/UTAH (2.2.1)

Population projections for the Nevada/Utah region indicate an annual growth rate of 5.1 percent in the six-county region studied in Nevada, and a 3.1 annual percent growth rate projected for the seven-county area studied in Utah. Population is directly related to certain emissions, in particular NO_x, CO, and HC from vehicle use, NO_x emissions from space heating and cooling, HC from the application and storage of solvents and paints, and HC from fuel storage and use. These emissions are expected to grow in proportion to the population change. Whether or not their emission growth will result in subsequent air quality degradation depends on the location and density of emission sources and the local meteorological and topographical characteristics.

Several industrial projects are proposed in the study area that will result in emissions of unknown quantities. These projects include the General Battery Manufacturing Plant near Nephi, Utah, the Continental Lime Plant near Fillmore, Utah, and the Precision Built Modular Home Manufacturing Plant near Delta, Utah.

Proposed energy and mining development in the study region will also generate potential air emission sources. Proposed mines in the Nevada study region number 21 (Forecast for the Future Minerals, Bulletin 82, Nevada Bureau of Mines and Geology). Other proposed mining facilities in the study area include a Molybdenum Mining-Processing facility near Minersville, Utah, a Martin-Marietta Cement Plant near Delta, Utah, an Anaconda molybdenum mine in Pine Basin, Nevada, and an Alunite mine in Wah Wah basin, Nevada. These proposed projects are all potential pollutant emission sources that may affect existing air quality levels.

Proposed energy-related projects that will affect future baseline emissions and air quality levels include a Geothermal Power Plant near Milford, Utah, a SUFCO Coal Loading Facility near Nephi, Utah, the Intermountain Power Project in Millard County, Utah (Sevier Basin), and the Allen Warner Valley Energy System near Las Vegas, Nevada, and the White Pine Power Plant in White Pine County, Nevada. Further energy-related development may occur along the potentially energy-rich overthrust belt which runs along the southwestern Utah and eastern Nevada border. The development of gas and oil fields may add to pollutant levels throughout the region.

All of the above proposed projects are in NAAQS attainment areas (with the exception of Steptoe Valley in White Pine County, Nevada), therefore air quality levels will be covered by PSD regulations that allow future sources to affect existing air quality levels up to the applicable PSD increment. Almost inevitably air pollutant levels can be expected to increase as a result of future energy and industrial projects and partially consume available PSD increments for SO_2 and TSP. Additional future projects will be constrained further by having less of the increment available to consume. PSD increments or similar regulations for the remaining criteria pollutants (CO, O_3, HC, NO_x, and Pb) are expected to be designated by EPA.

In nonattainment areas, a proposed project may be required to obtain emission offsets or propose other control strategies to demonstrate a net air quality benefit before the project is approved. Existing nonattainment areas where emission offsets or other control strategies may be required include Steptoe Valley (SO_2) and Las Vegas Valley (O_3, CO, and TSP), in Nevada.

TEXAS/NEW MEXICO (2.2.2)

Future emissions in the deployment area will depend on population projections, and industrial and energy development. Population of the Texas and New Mexico region is predicted to grow at an annual rate of 1.4 and 1.5 percent respectively, during 1980 to 1994. CO, NO_x, and HC emissions are expected to grow in proportion to the population change.

Predictions for industrial growth in the Texas/New Mexico region are uncertain. Any industrial or energy development in the area where NAAQS attainment areas exist would tend to worsen air quality levels and consume the available PSD increments. Other criteria pollutant levels may also increase as a result of industrial development.

Whether agricultural activity changes will be reflected in baseline changes or in increment consumption is not addressed by existing regulations. Future policy goals in this area need to be determined by the applicable air pollution regulatory authority.

3.0 AIR QUALITY MODEL DESCRIPTIONS

3.1 INTEGRATED MODEL FOR PLUMES AND ATMOSPHERICS IN COMPLEX TERRAIN (IMPACT)

The IMPACT computer code is a three-dimensional grid model for calculating concentrations of inert or reactive pollutants. A major feature of the IMPACT model is its treatment of complex terrain. Topographic influences on wind flows in the modeled region are simulated such that winds are diverted around or over terrain obstacles (hills and mountains), as compared to Gaussian models which assume uniform wind direction throughout the region. The IMPACT model is capable of simulating a wide variety of meteorologic conditions characteristic of mountainous terrain: valley drainage winds, upslope winds, and variable inversion heights.

IMPACT is well suited to regional air quality analyses, and is not intended as a means of identifying localized peak concentrations. Emissions and concentrations are averaged across each grid cell, hence the resolution of the model is dependent on the selection of grid cell sizes. High resolution modeling (grid sizes of 500 meters or less) is inhibited by the amount of computer time and storage which would be required to model an area. For example, a 40 by 40 kilometer area would require 100 grid cells, each 4 kilometers square, or 1,600 grid cells each 1 kilometer square. Vertical layering can increase these numbers even more.

The IMPACT model requires three types of data before performing concentration level analysis for a given region: 1) digitized terrain information, 2) pollutant emission rate data for all locations and times modeled, and 3) hourly meteorological data including wind speeds, mixing heights, and stability class for each meteorological site.

3.2 HIWAY

Detailed information regarding the EPA HIWAY line source computer code is available in the "User's Guide for HIWAY, A Highway Air Pollution Model" (EPA-650/4-74-008). A brief description follows:

HIWAY can be used for estimating the concentrations of nonreactive pollutants from highway traffic. This steady-state Gaussian model can be applied to determine air pollution concentrations at receptor locations downwind of "at-grade" and "cut-section" highways located in relatively uncomplicated terrain. For an at-grade highway, each lane of traffic is modeled as though it were a finite, uniformly emitting line source of pollution. For the cut section, the top of the cut is considered an area source. The area source is simulated by using ten line sources of equal source strength. The total source strength equals the total emissions from the lanes in the cut.

The air pollution concentration representative of hourly averaging times at a downwind receptor location is found by numerical integration along the length of each lane and a summing of the contributions from each lane. With the exception of receptors directly on the highway or within the cut, the model is applicable for any wind direction, highway orientation, and receptor location. The model was developed for situations in which horizontal wind flow occurs. The model cannot

consider complex terrain or large obstructions to the flow such as buildings or large trees.

3.3 POINT/AREA/LINE (PAL)

The "User's Guide for PAL" (EPA-600/4 - 78 - 013) contains a detailed description of the PAL model. The following is provided as a reference description:

PAL is a multi-source Gaussian-Plume atmospheric dispersion algorithm for estimating concentrations of non-reactive pollutants. Concentration estimates are based on hourly source emissions data and meteorology, and averages can be computed for averaging times from 1 to 24 hours. Six source types are included in PAL: points, areas, two types of line sources, and two types of curved path sources. As many as 30 sources may be included under each source type. PAL is not intended as an area-wide model but may be applied to estimate the contribution of part of an urban area or complex to the concentration at a designated receptor.

3.4 MODEL ASSUMPTIONS AND LIMITATIONS OF THE IMPACT, HIWAY AND PAL MODELS

All emissions modeled by the IMPACT, PAL and HIWAY computer codes are assumed to behave as conservative gases; i.e., gases which are nonreactive and which are not affected by physical removal processes. The assumption is most reasonable for inert or slowly reactive gaseous emissions (CO and NO_x). Fugitive dust emissions are modeled by assuming dust emissions behave as a gas, as no other method to model particulates has been established. Airborne concentrations of dust are nominally over-predicted as no mechanisms for removal of dust particles (through settling or impaction against the surface) are incorporated into these models. A more precise analysis requires a size distribution of fugitive dust particles in order to estimate the dust removal rates, and a numerical method capable of treating the physical removal of dust particles.

Concentrations reported by the IMPACT model are average values over a single grid cell. Two grid cell sizes are used in this study: 4,000 ft by 4,000 ft (for the operating base) and 4 km by 4 km (for the deployment area). The average concentration of the grid cell is useful in assessing regional effects, but does not reflect peak values which may occur within a grid cell. These localized peak impacts are evaluated using the EPA HIWAY and PAL computer codes in this study.

HIWAY and PAL, as other Gaussian models, are subject to limiting assumptions including uniform, steady-state atmospheric conditions, and relatively flat terrain. Gaussian models assume that pollutant concentrations are inversely proportional to the wind speed. Unrealistically high concentration estimates are produced during very low wind speed conditions due to this inverse relationship. Other modeling difficulties are also associated with low wind speeds. For example, if wind directions are extemely variable, the hourly average wind direction used in the model may well not be a true representation of the wind direction during the hour. The dispersion parameters used in HIWAY and PAL do not recognize this kind of variability in the wind thereby overestimating pollutant concentrations. Gaussian models also assume that there is no build-up of pollutants from hour to hour. That is, the concentration estimate made for a particular hour is independent of the concentration estimate made for the previous hour. This factor tends to cause

pollutant concentrations to be underestimated during low wind speed conditions when residual pollutant build-up may occur, especially in urban areas.

Care must also be exercised when comparing high hourly-average concentration estimates with longer term air quality standards, for example, comparing the one-hour concentration with the 8-hour standard. It would be unrealistic to assume that a single combination of wind direction, wind speed, and stability class which may maximize a single hourly value would persist during an 8-hour period. Similar care must be exercised when distances between the sources and receptors are such that pollutants carried by the wind would take more than one hour to cover the distance. The changes that occur in atmosphere under such conditions are not simulated well by Gaussian models.

HIWAY and PAL are both designed to make estimates over relatively level terrain. Receptor height cannot be used to simulate topographic differences since the height of the receptor is the height of that receptor above the local ground level, not the height of the ground above some reference plane.

The Pasquill-Gilford horizontal dispersion parameter values used in PAL are strictly applicable only to concentration estimates with a 3-minute averaging time (Pasquill, 1976). An increase would be expected in horizontal dispersion for the one-hour averaging assumed in the model. No adjustments have been made in the model to account for this effect, leaving the estimates once again on the conservative side; i.e., higher than actually would occur. The dispersion parameters used are considered applicable for a generally rural environment.

3.5 INDUSTRIAL SOURCE COMPLEX DISPERSION MODEL

The following is an excerpt from the ISC Users Guide (Bowers et al 1979):

> "The Industrial Source Complex (ISC) Dispersion Model combines and enhances various dispersion model algorithms into a set of two computer programs that can be used to assess the air quality impact of emissions from the wide variety of sources associated with an industrial source complex. For plumes comprised of particulates with appreciable gravitational settling velocities, the ISC Model accounts for the effects on ambient particulate concentrations of gravitational settling and dry deposition. Alternately, the ISC Model can be used to calculate dry deposition. The ISC short-term model (ISCST), an extended version of Single Source (CRSTER) Model (EPA, 1977), is designed to calculate concentration or deposition values for time periods of 1, 2, 3, 4, 6, 8, 12 and 24 hours. If used with a year of sequential hourly meteorological data, ISCST can also calculate annual concentration or deposition values. The ISC long-term model (ISCLT) is a sector-averaged model that extends and combines basic features of the Air Quality Display Model (AQDM) and the Climatological Dispersion Model (CDM). The long-term model uses statistical wind summaries to calculate seasonal (quarterly) and/or annual ground-level concentration or deposition values. Both ISCST and ISCLT use either a polar or a Cartesian receptor grid. The ISC Model computer programs are written in Fortran IV and require approximately

65,000 UNIVAC 1110 computer words. The major features of the ISC Model are listed in Table 3.5-1.

"The ISC Model programs accept the following source types: stack, area and volume. The volume source option is also used to simulate line sources. The steady-state Gaussian plume equation for a continuous source is used to calculate ground-level concentrations for stack and volume sources. The area source equation in the ISC Model programs is based on the equation for a continuous and finite crosswind line source. The generalized Briggs (1971 and 1975) plume-rise equations, including the momentum terms, are used to calculate plume rise as a function of downwind distance. Procedures suggested by Huber and Snyder (1976) and Huber (1977) are used to evaluate the effects of the aerodynamic wakes and eddies formed by buildings and other structures on plume dispersion. A wind-profile exponent law is used to adjust the observed mean wind speed from the measurement height to the emission height for the plume rise and concentration calculations. Procedures utilized by the Single Source (CRSTER) Model are used to account for variations in terrain height over the receptor grid. The Pasquill-Gifford curves (Turner, 1970) are used to calculate lateral (${}_y$) and vertical (${}_z$) plume spread. The ISC Model has rural and urban options. In the Rural Mode, rural mixing heights and the ${}_y$ and ${}_z$ values for the indicated stability category are used in the calculations. In Urban Mode 1, the stable E and F stability categories are redefined as neutral D stability. In Urban Mode 2, the E and F stability categories are combined and the ${}_y$ and ${}_z$ values for the stability category one step more unstable than the indicated stability category (except A) are used in the calculations. Urban mixing heights are used in both urban mades."

Table 3.5-1. Major features of the ISC model.

Polar or Cartesian coordinate systems
Plume rise due to momentum and buoyancy as a function of downwind distance for stack emissions (Briggs, 1971 and 1975)
Procedures suggested by Huber and Snyder (1976) and Huber (1977) for evaluating building wake effects
Procedures suggested by Briggs (1973) for evaluating stack-tip down-wash
Separation of multiple point sources
Consideration of the effects of gravitational settling and dry deposition on ambient particulate concentrations
Capability of simulating line, volume and area sources
Capability to calculate dry deposition
Variation with height of wind speed (wind-profile exponent law)
Concentration estimates for 1-hour to annual average
Terrain-adjustment procedures for complex terrain
Consideration of time-dependent exponential decay of pollutants

4.0 MODEL INPUTS

4.1 M-X-RELATED EMISSIONS

CONSTRUCTION SCHEDULE (4.1.1)

See Figures 4.1.1-1 through 2 and Tables 4.1.1-1 through 4.1.1-5.

DEPLOYMENT AREA (4.1.2)

Particulate Emissions (4.1.2.1)

Vehicular Road Dust (4.1.2.1.1)

Fugitive Dust Emissions from Unpaved Roads Associated with M-X Construction Activities

Road dust raised by construction vehicles will be a major source of particulate emissions during the construction phase of the M-X project. Fugitive dust emission results from the many miles of construction vehicle travel over the unpaved surfaces of the cluster and DTN roads. The force of a vehicle's wheels passing over unpaved roads causes pulverization of surface material. The pulverized particles are thrown into the air by the rolling wheels and lifted by the vehicle-induced turbulent wake which continues to act even after the vehicle has passed. The quantity of dust lifted into the air per given segment of road will vary linearly with the volume of traffic over the segment. In addition, the amount of emissions will depend on various factors such as vehicle speed, road surface texture, and surface moisture.

Field measurements have indicated that emissions are directly proportional to vehicle speed and to the number of wheels on the vehicle. Thus an eighteen-wheeled semi-truck carrying steel to a shelter site would raise 4.5 times as much dirt as a four-wheeled carry-all truck transporting a survey crew over the same segment of road.

The surface texture of the road is another important factor in determining the amount of dust emissions because emissions have been found to vary in direct proportion to the fraction of silt in the road surface material. Silt is defined by the American Association of State Highway Officials as particles smaller than 75m in diameter. The silt fraction is determined by measuring the proportion of loose, dry, surface dust that passes a 200-mesh screen using the ASTM-C-136 method.

Rainfall will also affect the dust emission rates. Emissions can be reduced to zero when the road surface is wet. However, unpaved roads generally have a hard, nonporous surface that dries quickly after a rainfall. This effect may be accounted for by neglecting emissions only on days with more than 0.01 in. of rainfall when the road surface is wet enough to nearly eliminate dust emissions.

The quantity of fugitive dust emissions from an unpaved road, per vehicle-mile of travel, may be estimated (within 20 percent) using the following empirical expression:

$$E = (0.81s)\left(\frac{S}{30}\right)\left(\frac{365-w}{365}\right) \qquad \text{Equation 1.}$$

Table 4.1.1-1. Construction schedule used for air quality modeling emission estimates.

SEGMENT NUMBER	CONSTRUCTION GROUP NUMBER	SHELTERS		CLUSTER ROADS		DTN	
		START	END	START	END	START	END
1	11	10/84	11/85	6/84	4/85	1/84	4/86
	4	6/85	11/86	4/85	4/86		
	5	7/86	8/87	4/86	1/87		
	6	5/87	6/88	1/87	11/87		
	12	3/88	7/89	11/87	11/88		
2	1	1/85	11/86	10/84	4/86	5/84	7/86
	2	8/86	2/88	4/86	6/87		
	3	10/87	7/89	6/87	5/88		
3	9	7/85	1/87	3/85	5/86	10/84	1/87
	10	9/86	11/87	5/86	4/87		
	8	7/87	10/88	4/87	2/88		
	7	6/88	7/89	2/88	5/89		
4	16	7/75	9/86	3/85	1/86	10/84	9/86
	15	5/86	9/87	1/86	1/87		
	14	5/87	8/88	1/87	12/87		
	13	4/88	7/89	12/87	11/88		

4146

[1]Representative of a typical schedule for full deployment in either Nevada/Utah of Texas/New Mexico. Changes in schedule have minimal effect on calculation of daily emission rates for a single construction group area.

Table 4.1.1-2. DTN construction equipment list.

EQUIPMENT TYPE	NUMBER OF VEHICLES			
	SEGMENT 1	SEGMENT 2	SEGMENT 3	SEGMENT 4
Passenger Car	50	50	50	50
Carry-all	3	3	3	3
30-ton Truck[2]	32	24	27	29
Spray Truck	2	2	2	2
Semi	1	1	1	1
Tank Truck	3	3	3	3
Water Truck[3]	170	130	149	158
Off-Road Truck	39	31	34	36
D-5 Dozer	17	13	15	16
12-G Grader	44	34	39	41
Backhoe	3	2	2	3
641-B Scraper	23	18	20	21
Compactor	50	38	44	46
Pipelayer	3	2	2	3
Paver	4	3	3	4
Roller	8	6	7	7

4147

[1]Represents preliminary estimates of the total number of each vehicle type to be allocated to the four primary construction segment areas (see Figure 4.1.1-1) for DTN road construction. Preliminary estimates used for air quality modeling calculations.

[2]30-ton trucks used for bituminous surfacing operations which occur after completion of system construction.

[3]Water trucks and spray trucks not considered as a source of fugitive road dust.

Table 4.1.1-3. Cluster road construction equipment list.

EQUIPMENT TYPE	NUMBER OF VEHICLES			
	SEGEMENT 1	SEGMENT 2	SEGMENT 3	SEGMENT 4
Passenger Car	50	50	50	50
Carry-all	6	4	5	5
Semi	2	1	2	2
Tank Truck	3	3	3	3
Water Truck[2]	233	179	204	216
Off-Road Truck	73	56	64	67
641-B Scraper	8	7	7	8
D-5 Dozer	13	10	12	13
12-G Grader	40	30	35	37
Backhoe	5	4	4	4
Spreader	1	1	1	1
Compactor	61	47	53	57
Pipelayer	5	4	4	4

4148

[1]Represents preliminary estimates of the total number of each vehicle type to be allocated to the four primary construction segment areas (see Figure 4.1.1-1) for cluster road construction. Preliminary estimates used for air quality modeling calculations.

[2]Water tanks not considered as a source of fugitive road dust.

4.1.1-4. **Shelter construction equipment list.**

EQUIPMENT TYPE	NUMBER OF VEHICLES			
	SEGMENT 1	SEGMENT 2	SEGMENT 3	SEGMENT 4
Passenger Car	50	50	50	50
Carry-all	3	2	2	3
32-ton Truck	3	3	3	3
Concrete Truck	50	39	44	47
Semi	2	1	1	1
Water Truck[2]	224	171	196	208
Flatbed Truck	12	10	11	11
D-5 Dozer	10	7	8	9
Compactor	3	2	2	3
D-9 with Ripper	4	4	4	4
641-B Scraper	6	5	5	6
12-G Grader	2	1	1	1

4149

[1]Represents preliminary estimates of the total number of each vehicle type to be allocated to the four primary construction segement areas (see Figure 4.1.1-1) for shelter construction. Preliminary estimates used for air quality modeling calculations.

[2]Water trucks not considered as a source of fugitive road dust.

Table 4.1.1-5. **Summary of construction-related dust emission rates in a representative deployment area valley with a construction camp: The Dry Lake-Delamar Valley. (Page 1 of 2)**

ACTIVITY OR SOURCE	WORST CASE RATE (tons/day)*	BEST CASE RATE (tons/day)*
DTN construction road dust	172.6[2]	20.6[3]
Cluster road construction road dust	284.0[2]	33.9[3]
Shelter construction road dust	94.5[2]	11.3[3]
DTN construction activities	1.89[4]	0.9[5]
Cluster road construction activities	23.6[4]	11.8[5]
Shelter construction activities	7.4[4]	3.7[5]
Sand and gravel processing for DTN road base	0.3[6]	0.3[6]
Sand and gravel processing for cluster road road base	0.8[6]	0.8[6]
Sand and gravel processing for shelters	0.05[6]	0.05[6]
Sand and gravel processing for DTN bituminous surfacing	8.8[6,7]	8.8[6,7]
Stone quarrying and processing for DTN road base	1.1[8]	0.28[9]
Stone quarrying and processing for cluster road base	3.2[8]	0.8[9]
Stone quarrying and processing for shelters	0.82[8]	0.21[9]
Stone quarrying and processing for DTN bituminous surfacing	35.2[7,8]	8.8[7,9]
Asphaltic concrete plant	7,918.0[7,10]	7.0[7,11]
Concrete batching plant	0.1[12]	0.01[13]
Aggregate storage piles for DTN, cluster road, and shelter material	9.23[14]	0.92[15]
Wind erosion from disturbed surfaces and roads	168.0[16,17]	168.0[16,17]

4150

Table 4.1.1-5. Summary of construction-related dust emission rates in a representative deployment area valley with a construction camp: The Dry Lake-Delamar Valley. (Page 2 of 2)

*Worst case emissions indicate no mitigation measures applied. The best case emission rates represent the smallest emission rate possible, according to published emission factors, using all possible mitigation. The worst and best case emission rates are presented to show the range of emission rates possible.

[1]Rates are reported as average values over the lifetime of the construction activity.

[2]Emission factor = 22.4 lb. of dust per vehicle per mile traveled (factor calculation assumes 20 percent silt content in road material, 45 mph average speed, and 29 construction days per year with 0.01 in. or more rainfall).

[3]Emission factor = 5.3 lb. of dust per vehicle per mile traveled (factor calculation assumes 8 percent silt content in road material, 30 mph average speed, and 64 construction days per year with 0.01 in. or more rainfall). Watering used as control measure and assumed to be 50 percent effective.

[4]Emission rate = 1.8 tons of dust per acre of construction per month of activity. No control measures.

[5]Emission rate = 0.9 tons of dust per acre of construction per month of activity. Watering used as control measure and assumed to be 50 percent effective.

[6]Emission factor = 0.1 ob. of dust per ton of material processed.

[7]Value is total emissions of dust in tons.(Rate unknown because time period for process unspecified.)

[8]Emission factor = 1.6 lb. of dust per ton of material produced. No control measures.

[9]Emission factor = 0.4 lb. of dust per ton of material produced. Cyclone collectors and fabric filters can provide 75 to 99 percent control. 75 percent control assumed in this example.

[10]Emission factor = 45.0 lb. of dust per ton of material processed. No control measures.(Rate unknown because time period for process unspecified.)

[11]Emission factor = 0.04 lb. of dust per ton of material processed. Orifice-type scrubber used as best control available. (Rate unknown because time period for process unspecified.)

[12]Emission factor = 0.2 lb. of dust per cubic yard of material produced. No control measures.

[13]Emission factor = 0.02 lb. of dust per cubic yard of material produced. Enclosures, filters, and watering used as control measures.

[14]Emission factor = 615.4 lb. of dust per acre of storage per day. No control measures.

[15]Emission factor = 61.5 lb. of dust per acre of storage per day. Water applied to storage yard traffic areas and chemical stabilizers used on storage piles as control measures.

[16]Emission factor = 6.0 tons of dust per acre of roadway per year (DTN and cluster roads).

[17]Emission factor = 9.1 tons of dust per acre of native soil disturbed per year (shelter areas).

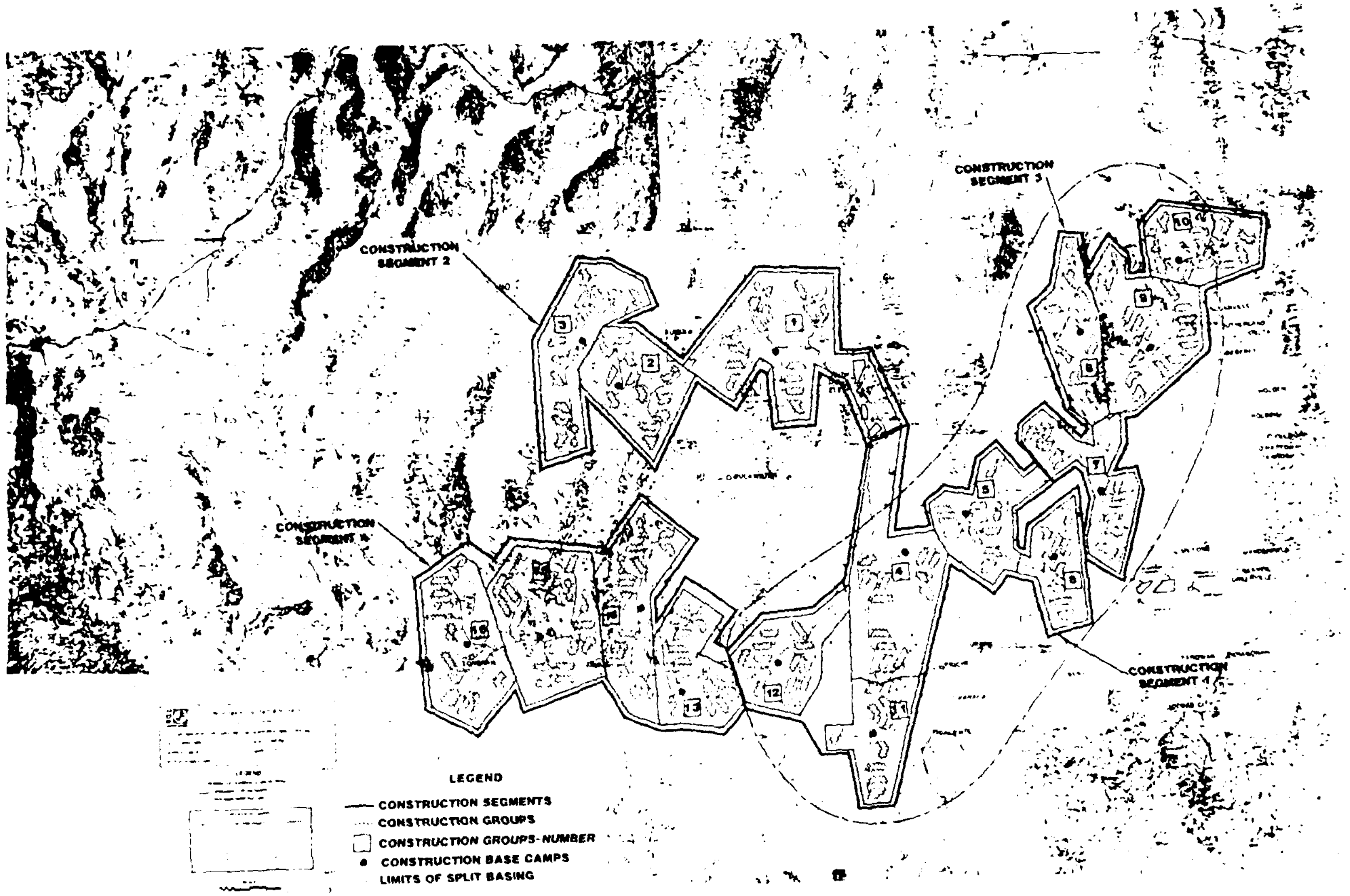

Figure 4.1.1-1. Nevada/Utah construction layout used for air quality modeling loop system. (Layout has since been revised, but enough similarity remains that air quality modeling is still valid. Air quality modeling for such large areas is mainly a function of activity level within the area, rather than the exact roadway layout.)

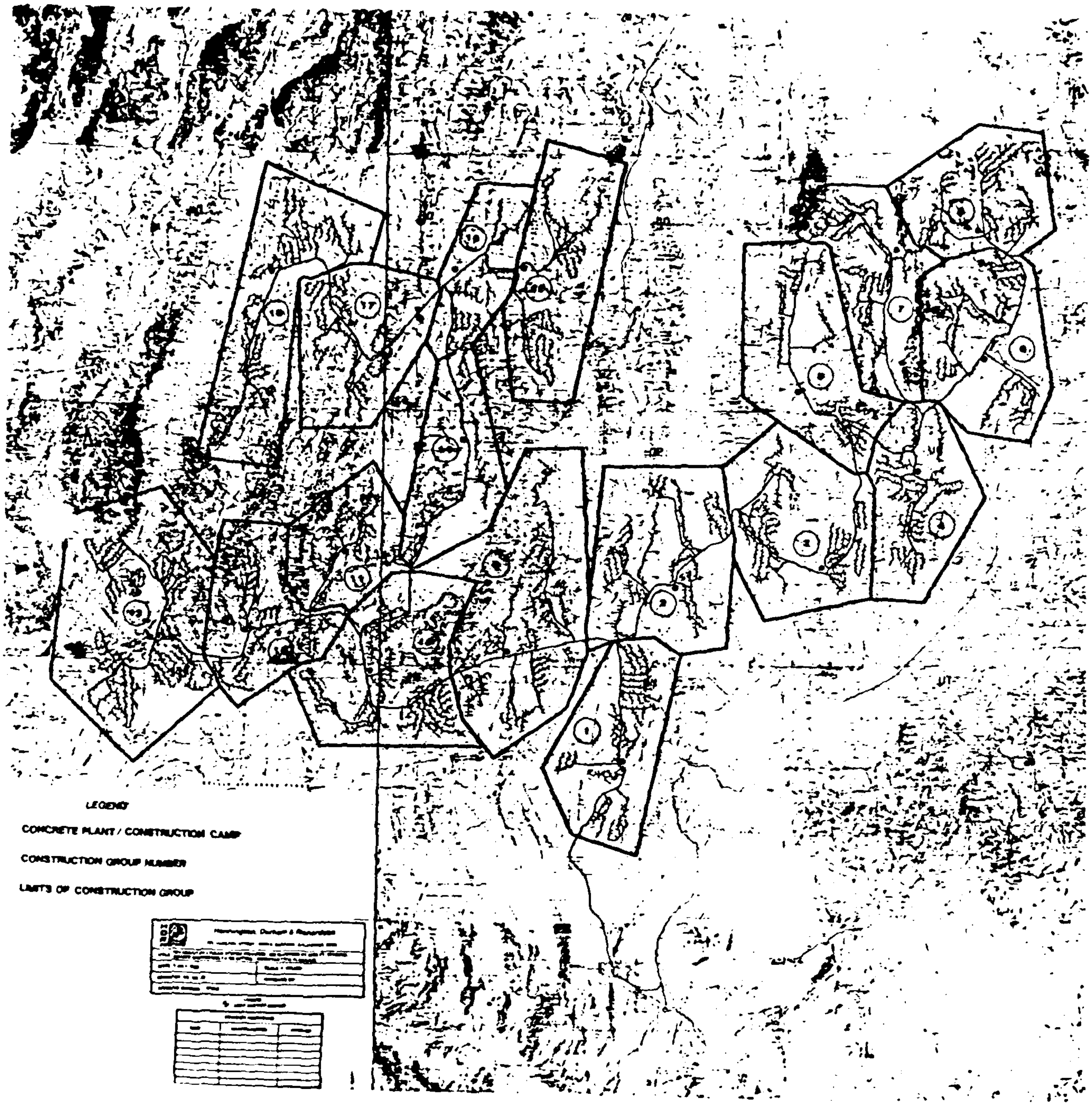

Figure 4.1.1-2. Nevada/Utah construction layout used for air quality modeling-linear system. (Layout has since been revised, but enough similarity remains that air quality modeling is still valid. Air quality modeling for such large areas is mainly a function of activity level within the area, rather than the exact roadway layout.

where:

E	=	Emission factor, pounds per vehicle-mile
s	=	Silt content of road surface material, percent
S	=	Average vehicle speed, miles per hour
w	=	Mean annual number of days with 0.01 in. or more of rainfall.

The equation is valid for vehicle speeds in the range of 30 to 50 mi/hr.

As a first step approximation, the above emission factor has been calculated as a minimum and maximum value for the conditions expected in the M-X Nevada/Utah proposed deployment area. These minimum and maximum factors have then been used to determine "best case" and "worst case" emissions which would result for a particular construction schedule which specifies type of equipment and length of construction activity for each of the major construction scenarios (shelter construction, DTN construction, and cluster road construction).

Cluster roads, and initially the DTN roads, will be formed by the spreading of an aggregate material which will be gravel-like in nature. Studies have shown that the silt content of gravel roads averages about 12 percent. The amount of silt in the road surface material was therefore estimated to range between 8 and 20 percent as minimum and maximum values possible. This range is in accord with good engineering practice which requires this same range for the silt content found in a gravel road. Less than 8 percent silt content causes loss of cohesion properties. More than 20 percent silt content reduces the stability of the surface.

Estimates of the daily average speed rates of the construction equipment over the roadway surfaces were assumed to vary from 30 to 45 mi/hr. Dust emissions increase with increased vehicle speed. Therefore, 45 mi/hr is the conservative emission estimate.

The mean annual number of days with 0.01 in. or more of rainfall is 40 to 90 days for the Nevada/Utah proposed deployment area as determined from a figure given in the Climatic Atlas of the United States. The number of days with 0.01 in. or more of rainfall was reduced by a factor of five-sevenths (0.714) because concern was only with road dust emission on construction days. Construction is assumed to take place five days a week, eight hours a day. The minimum and maximum values of significant rainfall days therefore become 29 and 64, respectively.

Using the above ranges for the correction parameters, the minimum and maximum values of the fugitive dust emission factor were calculated with Equation 1.

$$E_{min} = 0.81(8)\ \frac{30}{30}\ \frac{365 - 64}{365}$$

$$= 5.34 \text{ lbs/vehicle-mile}$$

$$E_{max} = 0.81(20)\ \frac{45}{30}\ \frac{365 - 29}{365}$$

$$= 22.40 \text{ lbs/vehicle-mile} \qquad \text{Equation 2.}$$

These emission factors are used in conjunction with specific construction schedules (number of construction days) and equipment allocations (number of vehicles and

mi/day traveled) to determine the total ground-level dust emissions for either the total project area, construction segment area, or cluster group area. Tables 4.1.2.1.1-1 through 4.1.2.1.1-3 presents worst-case road dust emissions for each construction segment due to DTN, cluster road, or shelter construction. A more specific analysis could only be achieved by the use of correction parameters dependent on the particular site in question.

Special considerations are needed to determine the fraction of the total emissions that will remain suspended indefinitely. The potential drift distance of particles is governed by the diameter of the particle, initial injection height of the particle, the particle's terminal settling velocity, and the degree of atmospheric turbulence. Theoretical drift distances, as a function of particle diameter and mean wind speed, have been computed for unpaved road emissions. These results indicate that, for a typical mean wind speed of 10 mi/hr, particles larger than about 100 micron are likely to be deposited on the ground within 30 feet from the edge of the road. Dust that settles within this distance is not included in Equation 1. Particles that are 30 to 100 micron in diameter are likely to undergo impeded settling. These particles, depending upon atmospheric turbulence, are likely to settle within a few hundred feet from the road. Smaller particles, particularly those less than 15 μm in diameter, have much slower gravitational settling velocities and are much more likely to have their settling rate retarded by atmospheric turbulence. Thus, based on the presently available data, it appears appropriate to report only those particles smaller than 30 μm as emissions that may remain indefinitely suspended. For gravel roads, approximately 62 percent of the emissions predicted by Equation 1 would be particles less than 30 μm; i.e., indefinitely suspended emissions. Table 4.1.2.1.1-4 summarizes the mitigated and unmitigated emission rates of suspended fugitive road dust particulates. The table identifies rates for each activity taking place within the four major construction segments (see Figure 4.1.1-1 for layout description). Each construction area (designated as a construction group) within a given segment is subject to the same average emission rate for a particular activity because the same equipment is being used for each group within the segment. Note also that the "best case" rates have been reduced by half on the assumption that watering will take place in sufficiently frequent intervals to provide 50 percent effective control. Water requirements for M-X construction mitigations will be refined during review of the DEIS and as part of the Tier 2 study effort.

Basic equation for suspended dust from unpaved (gravel) roads

- factors used in derivation apply to Nevada/Utah/Texas/New Mexico area

E = dust emission rate
E_s = dust which remains indefinitely suspended emission rate

minimum values:

$$E = \frac{5.34 \text{ lb}}{\text{vehicle-mi}} \times \frac{\text{no. of vehicle wheels}}{4}$$

$$E_s = \frac{3.31 \text{ lb}}{\text{vehicle-mi}} \times \frac{\text{no. of wheels}}{4}$$

maximum values

$$E = \frac{22.40 \text{ lb}}{\text{vehicle-mi}} \times \frac{\text{no. of wheels}}{4}$$

$$E_s = \frac{13.89 \text{ lbs}}{\text{vehicle-mi}} \times \frac{\text{no. of wheels}}{4}$$

Table 4.1.2.1.1-1. Road dust emission associated with DTN construction.

SEGMENT NUMBER	VEHICLE TYPE	NUMBER OF VEHICLES	DISTANCE TRAVELED (mi/day)	WHEEL CORRECTION FACTOR	NUMBER OF CONSTRUCTION DAYS	DUST EMISSIONS PER DAY (tons) (3.)x(4.)x(5.) x E.F.[2]	TOTAL DUST EMISSIONS (tons) (3.)x(4.)x(5.) x(6.)x E.F.[2]
1	Offroad Truck	40	240	8/4 = 2.0[3]	586	215.0	126,013
	Semi	1	500	18/4 = 4.5	586	25.2	14,767
	Tank Truck	3	500	16/4 = 4.0	586	67.2	39,379
	Passenger	50	100	4/4 = 1.0	586	56.0	32,816
Sub-total						363.4	212,975
2	Offroad Truck	30	240	8/4 = 2 0[3]	564	161.3	90,962
	Semi	1	500	18/4 = 4.5	564	25.2	14,213
	Tank Truck	3	500	16/4 = 4.0	564	67.2	37,901
	Passenger	50	100	4/4 = 1.0	564	56.0	31,584
Sub-total						309.7	174,660
3	Offroad Truck	34	240	8/4 = 2.0[3]	586	182.8	107,111
	Semi	1	500	18/4 = 4.5	586	25.2	14,767
	Tank Truck	3	500	16/4 = 4.0	586	67.2	39,379
	Passenger	50	100	4/4 = 1.0	586	56.0	32,816
Sub-total						331.2	194,073
4	Offroad Truck	36	240	8/4 = 2.0[3]	500	193.5	96,768
	Semi	1	500	18/4 = 4.5	500	25.2	12,600
	Tank Truck	3	500	16/4 = 4.0	500	67.2	33,600
	Passenger	50	100	4/4 = 1.0	500	56.0	28,000
Sub-total						341.9	170,968
Total						1,346.2	752,676

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[1]Assumes 100 percent equipment operation throughout entire time period of segment construction and use of maximum emission factor.

[2]E.F. (Emission Factor) = 0.0112 ton/vehicle-mile. Based on 20 percent silt content, 45 mi/hr average speed, and 29 days with more than 0.01 in. of rainfall.

[3]Eight wheels assumed instead of the actual 4 because of massive size.

Table 4.1.2.1.1-2. Road dust emissions associated with cluster road construction.

SEGMENT NUMBER	VEHICLE TYPE	NUMBER OF VEHICLES	DISTANCE TRAVELED (mi/day)	WHEEL CORRECTION FACTOR	NUMBER OF CONSTRUCTION DAYS	DUST EMISSIONS PER DAY (tons) (3.)x(4.)x(5.) x E.F.[2]	TOTAL DUST EMISSIONS (tons) (3.)x(4.)x(5.) x(6.)x E.F.[2]
1	Tank Truck	3	500	16/4 = 4.0	1,151	67.2	77,347
	Offroad Truck	73	240	8/4 = 2.0[3]	1,151	392.4	451,708
	Semi	2	500	18/4 = 4.5	1,151	50.4	58,010
	Passenger	50	100	4/4 = 1.0	1,151	56.0	64,456
Sub-total						566.0	651,521
2	Tank Truck	3	500	16/4 = 4.0	934	67.2	62,765
	Offroad Truck	56	240	8/4 = 2.0[3]	934	301.1	281,186
	Semi	1	500	18/4 = 4.5	934	25.2	23,537
	Passenger	50	100	4/4 = 1.0	934	56.0	52,304
Sub-total						449.6	419,792
3	Tank Truck	3	500	16/4 = 4.0	1,020	67.2	68,544
	Offroad Truck	64	240	8/4 = 2.0[3]	1,020	344.0	350,945
	Semi	2	500	18/4 = 4.5	1,020	50.4	51,408
	Passenger	50	100	4/4 = 1.0	1,020	56.0	57,120
Sub-total						517.6	528,017
4	Tank Truck	3	500	16/4 = 40	956	67.2	64,243
	Offroad Truck	67	240	8/4 = 2.0[3]	956	360.2	344,344
	Semi	2	500	18/4 = 4.5	956	50.4	48,182
	Passenger	50	100	4/4 = 1.0	956	56.0	53,536
Sub-total						533.8	510,305
Total						2,067.0	2,109,635

4151

[1]Assumes 100 percent equipment operation throughout entire time period of segment construction and use of maximum emission factor.

[2]E.F. (Emission Factor) = 0.0112 ton/vehicle-mile. Based on 20 percent silt content, 45 mi/hr average speed, and 29 days with more than 0.01 in. of rainfall.

[3]Eight wheels assumed instead of the actual 4 because of massive size.

Table 4.1.2.1.1-3. Road dust emissions associated with shelter construction.

SEGMENT NUMBER	VEHICLE TYPE	NUMBER OF VEHICLES	DISTANCE TRAVELED (mi/day)	WHEEL CORRECTION FACTOR	NUMBER OF CONSTRUCTION DAYS	DUST EMISSIONS PER DAY (tons) (3.)x(4.)x(5.) x E.F.[2]	TOTAL DUST EMISSIONS (tons) (3.)x(4.)x(5.) x(6.)x E.F.[2]
1	32-ton Truck	3	500	18/4 = 4.5	1,239	75.6	93,668
	Concrete Truck	50	150	6/4 = 1.5	1,239	126.0	156,114
	Semi	2	500	18/4 = 4.5	1,239	50.4	62,446
	Passenger	50	100	4/4 = 1.0	1,239	56.0	69,384
Sub-total						308.0	381,612
2	32-ton Truck	3	500	18/4 = 4.5	1,173	75.6	88,679
	Concrete Truck	39	150	6/4 = 1.5	1,173	98.3	115,282
	Semi	1	500	18/4 = 4.5	1,173	25.2	29,560
	Passenger	50	100	4/4 = 1.0	1,173	56.0	65,688
Sub-total						255.1	299,209
3	32-ton Truck	3	500	18/4 = 4.5	1,043	75.6	78,851
	Concrete Truck	44	150	6/4 = 1.5	1,043	110.9	115,648
	Semi	1	500	18/4 = 4.5	1,043	25.2	26,284
	Passenger	50	100	4/4 = 1.0	1,043	56.0	58,408
Sub-total						267.7	279,191
4	32-ton Truck	3	500	18/4 = 4.5	1,043	75.6	78,851
	Concrete Truck	47	150	6/4 = 1.5	1,043	118.4	123,533
	Semi	1	500	18/4 = 4.5	1,043	25.2	26,284
	Passenger	50	100	4/4 = 1.0	1,043	56.0	58,408
Sub-total						275.2	287,076
Total						1,106.0	1,247,088

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[1]Assumes 100 percent equipment operation throughout entire time period of segment construction and use of maximum emission factor.

[2]E.F. (Emission Factor) = 0.0112 ton/vehicle-mile. Based on 20 percent silt content, 45 mi/hr average speed, and 29 days with more than 0.01 in. of rainfall.

[3]Eight wheels assumed instead of the actual 4 because of massive size.

Table 4.1.2.1.1-4. Suspended fugitive road dust emission rates-summary tables. Nevada/Utah deployment area. (Page 1 of 3)

SEGMENT NUMBER	GROUP NUMBER	SHELTER CONSTRUCTION[1]		
		CONSTRUCTION TIME PERIOD (No. Working Days)	"BEST CASE" EMISSION RATE[3] TONS/DAY (Tonnes/Day)	"WORST CASE" EMISSION RATE[4] TONS/DAY (Tonnes/Day)
1	11	10/84-11/85 (292)	11.3 (10.2)	94.5 (85.7)
	4	6/85-11/86 (369)	11.3 (10.2)	94.5 (85.7)
	5	7/86-8/87 (282)	11.3 (10.2)	94.5 (85.7)
	6	5/87-6/88 (282)	11.3 (10.2)	94.5 (85.7)
	12	3/88-7/89 (347)	11.3 (10.2)	94.5 (85.7)
2	1	1/85-11.86 (477)	10.6 (9.6)	89.2 (80.9)
	2	8/86-2/88 (391)	10.6 (9.6)	89.2 (80.9)
	3	10/87-7/89 (456)	10.6 (9.6)	89.2 (80.9)
3	9	7/85-1/87 (391)	10.4 (9.4)	86.8 (78.7)
	10	9/86-11/87 (304)	10.4 (9.4)	86.8 (78.7)
	8	7/87-10/88 (326)	10.4 (9.4)	86.8 (78.7)
	7	6/88-7/89 (282)	10.4 (9.4)	86.8 (78.7)
4	16	7/85-9/86 (304)	10.8 (9.8)	90.6 (82.2)
	15	5.86-9.87 (347)	10.8 (9.8)	90.6 (82.2)
	14	5/87-8/88 (326)	10.8 (9.8)	90.6 (82.2)
	13	4/88-7/89 (326)	10.8 (9.8)	90.6 (82.2)

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Table 4.1.2.1.1-4. Suspended fugitive road dust emission rates-summary tables. Nevada/Utah deployment area. (Page 2 of 3)

SEGMENT NUMBER	GROUP NUMBER	CLUSTER ROAD CONSTRUCTION[2]		
		CONSTRUCTION TIME PERIOD (No. Working Days)	"BEST CASE" EMISSION RATE[3] TONS/DAY (Tonnes/Day)	"WORST CASE" EMISSION RATE[4] TONS/DAY (Tonnes/Day)
1	11	6/84-4/85 (216)	33.9 (30.7)	284.0 (257.6)
	4	4/85-4/86 (261)	33.9 (30.7)	284.0 (257.6)
	5	4/86-1/87 (195)	33.9 (30.7)	284.0 (257.6)
	6	1/87-11/87 (216)	33.9 (30.7)	284.0 (257.6)
	12	11/87-11/88(261)	33.9 (30.7)	284.0 (257.6)
2	1	10/84-4/86 (391)	27.0 (24.5)	225.9 (204.9)
	2	4/86-6/87 (304)	27.0 (24.5)	225.9 (204.9)
	3	6/87-5/88 (239)	27.0 (24.5)	225.9 (204.9)
3	9	3/85-5/86 (304)	30.3 (27.5)	253.9 (230.3)
	10	5/86-4/87 (239)	30.3 (27.5)	253.9 (230.3)
	8	4/87-2/88 (216)	30.3 (27.5)	253.9 (230.3)
	7	2/88-2/89 (261)	30.3 (27.5)	253.9 (230.3)
4	16	3/85-1/86 (216)	31.5 (28.6)	264.1 (239.5)
	15	1/86-1/87 (261)	31.5 (28.6)	264.1 (239.5)
	14	1/87-12/87 (239)	31.5 (28.6)	264.1 (239.5)
	13	12/87-11/88(239)	31.5 (28.6)	264.1 (239.5)

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Table 4.1.2.1.1-4. Suspended fugitive road dust emission rates-summary tables. Nevada/Utah deployment area. (Page 3 of 3)

SEGMENT NUMBER	GROUP NUMBER	DTN CONSTRUCTION[2]		
		CONSTRUCTION TIME PERIOD (No. Working Days)	"BEST CASE" EMISSION RATE[3] TONS/DAY (Tonnes/Day)	"WORST CASE" EMISSION RATE[4] TONS/DAY (Tonnes/Day)
1	11	1/84-6/84 (105)	20.6 (18.7)	172.6 (156.5)
	4	6/84-12/84 (136)	20.6 (18.7)	172.6 (156.5)
	5	12/84-4/85 (94)	20.6 (18.7)	172.6 (156.5)
	6	4/85-10/85 (115)	20.6 (18.7)	172.6 (156.5)
	12	10/85-4/86 (136)	20.6 (18.7)	172.6 (156.5)
2	1	5/84-3/85 (210)	16.6 (15.1)	139.3 (126.3)
	2	3/85-10/85 (157)	16.6 (15.1)	139.3 (126.3)
	3	10/85-7/86 (197)	16.6 (15.1)	139.3 (126.3)
3	9	10/84-6/85 (179)	18.2 (16.5)	152.6 (138.4)
	10	6/85-1/86 (144)	18.2 (16.5)	152.6 (138.4)
	8	1/86-7/86 (132)	18.2 (16.5)	152.6 (138.4)
	7	7/86-1/87 (132)	18.2 (16.5)	152.6 (138.4)
4	16	10/84-3/85 (115)	19.0 (17.2)	159.3 (144.5)
	15	3/85-9/85 (134)	19.0 (17.2)	159.3 (144.5)
	14	9/85-3/86 (125)	19.0 (17.2)	159.3 (144.5)
	13	3/86-9/86 (125)	19.0 (17.2)	159.3 (144.5)

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[1] Emission rates reported as average values over lifetime of shelter construction within group area. Less than 100 percent allocated equipment operation at beginning and end of group construction period.

[2] Emission rates reported as average values over entire lifetime of construction activity (cluster road or DTN) within a segment. Assumes 100 percent allocated equipment operation throughout group construction periods.

[3] Based on emission factor of 5.3 lbs. of dust per vehicle per mile of travel. Watering is used as a control measure and assumed to be 50 percent effective.

[4] Based on emission factor of 22.4 lbs. of dust per vehicle per mile of travel.

Note: Semi-trucks, 32-ton trucks, and tank trucks assumed to travel only 40 miles of 500 mile daily trips within a single group area.

- minimum values assume lower silt content of road surface material, lower average vehicle speed, greater number of days with 0.01 in. or more of rainfall

- effective watering program (as identified in AP-42) can essentially cut all rates in half; however, specific quantities of water required to reduce emissions by 50 percent are not known, since information on dust palliatives to be used, application rates, and site-specific data are not available at this time.

Road Dust

Probable case emission rates used in modeling

E = 12.7 lb/vehicle-mile

Probable case assumes:

s = 12 percent
S = 45 mph
w = 47 days

Cluster Roads Construction

$$284^* \times \frac{12.7}{22.4} = 161 \text{ tons/day}$$

(*Worst-case values from Table 4.1.2.1.1-4)

161 tons/day = 5,072 g/sec

Assume 75 percent of cluster road construction vehicle travel is on DTN roads to batch plant and aggregate storage facilities:

5,072 x 0.25 = 1,268 g/sec dist. on cluster roads
5,072 x 0.75 = 3,804 g/sec dist. on DTN

Watering of roads is assumed to be 50 percent effective, oiling 90 percent effective,

1,268 x 0.5 = 634 g/sec on cluster roads after watering
3,804 x 0.1 = 380 g/sec on DTN after oil

Shelter Construction

$$94.5^* \times \frac{12.7}{22.4} = 53.6 \text{ tons/day} = 1.688 \text{ g/sec}$$

(*Worst-case values from Table 4.1.2.1.1-4)

Assume 75 percent of shelter construction vehicle travel is on DTN roads to batch plant and aggregate storage facilities:

1,688 x 0.25 x 0.5 = 211 g/sec on cluster roads in shelter area after watering

1,688 x 0.75 x 0.1 = 127 g/sec on DTN after oil

Total to spread out on DTN = 380 + 127 = 507 g/sec.

Construction Activity Fugitive Dust (4.1.2.1.2)

Particulate Emissions due to Shelter, Cluster, and DTN Construction Activities

Particulates are emitted during land clearing, blasting, ground excavation, cut-and-fill operations, and the construction of the shelters, cluster, and DTN roads. The AP-42 unmitigated emission factor used to calculate construction emissions is 1.2 tons per acre of construction per month of activity. This factor is to be used for normal construction activity rates similar to shopping center construction. M-X construction activities are expected to proceed at a more intensive pace than normal construction, so the emission factor was increased by fifty percent (1.8 tons per acre of construction per month of activity). The emission factor was reduced by 25 percent for the reasonable mitigated case by assuming the use of water applications as a dust control measure. Table 4.1.2.1.2-1 indicates the estimated acreage disturbed per unit of roadway or per shelter constructed. Construction activity emissions were calculated using total acreage disturbed figures for each construction group based on miles of road or number of shelters within the group. The above-described construction activity emission estimates include only particulates smaller than 30μm in diameter.

Probable case emission rates refer to the application of an effective watering program (as identified in EPA's AP-42) to reduce emission rates by 25 percent. Chemical stabilizers are recommended for use after construction to prevent particulate emissions from exposed surfaces. As with road dust from vehicles, the specific quantities of water required to reduce emissions by up to 50 percent are not known since information on the effectiveness and type of dust palliatives to be used, application rates, and site-specific data are not available at this time.

Stationary Sources (Excavation, Production, and Processing of Construction Materials) (4.1.2.1.3)

Particulate Emissions from the Excavation, Production, and Processing of Shelter, Cluster, and DTN Construction Materials

Particulates are emitted during the excavation, production, and processing of certain materials needed for construction of the M-X shelters, cluster roads, and DTN roads. Bituminous surface, concrete, and aggregate-base materials will all be excavated, produced, or processed to some degree locally, causing particulate emissions. This section describes the emissions estimates for the activities associated with providing these materials.

Construction activities for each required material which produces particulate emissions are listed in Table 4.1.2.1.3-1. Each material required has specific processes required for which particulate emissions are calculated.

An estimate of the quantity of materials to be processed is necessary to determine the potential emissions for each activity.

Table 4.1.2.1.2-1. Acreage disturbed per unit of DTN or shelter road or per shelter constructed.

ITEM	ACREAGE DISTURBED
DTN Road	15 Acres/Mile of Road
Cluster Road	12 Acres/Mile of Road
Shelters	7.5 Acres/Shelter

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Table 4.1.2.1.3-1. Excavation, production, and processing activities required for construction of shelters, cluster roads, and DTN roads.

MATERIAL	CONSTRUCTION USE	EXCAVATION, PRODUCTION, AND PROCESSING REQUIRED
Aggregate base	DTN roads Cluster roads	Sand and gravel processing plants. Aggregate storage piles. Stone quarrying and processing plants.
Bituminous surface	DTN roads	Sand and gravel processing plants. Aggregate storage piles. Asphaltic concrete plants. Stone quarrying and processing plants.
Concrete	Shelters	Sand and gravel processing plants. Concrete batching plants. Aggregate storage piles. Stone quarrying and processing plants.

1056-1

The materials required for an alternative (materials estimates were derived using the 100 percent Nevada/Utah loop alternative with 6,000 ft spacing; critical factors for the purposes of deriving emissions estimates do not vary significantly for average construction groups for most alternatives). Nevada/Utah system layout are listed in Table 4.1.2.1.3-2. One hundred percent of the bituminous surface and concrete needed will be processed or produced locally. Also, 100 percent of the aggregate material needed for aggregate base, bituminous surface, and concrete material will be excavated and processed locally.

It was assumed that 100 percent of the final material required by weight (as discussed above) was processed, produced, or excavated during each activity. This assumption may slightly overestimate (by no more than 10 percent) total emissions.

Daily emission rates were determined by assuming that construction activities will occur at an average daily rate for each construction group and construction mode. Actual daily emission rates may vary an undetermined amount from the average daily rate calculated here, due to operation schedule variations. The estimated daily rates are given to indicate the potential average daily emission rate if plants are operated at a steady rate from start-up to completion date.

Emissions are estimated considering either "no emission controls" or "probable emission controls" applied when emission factors are given for both options. The emission rates for all construction activities considered are listed in the summary Table 4.1.1-5. Successful control techniques for the activities discussed include watering and applied chemical pallatives for aggregate storage piles, sand and gravel processing plants, and concrete batching plants, and mechanical control devices for asphaltic concrete plants and concrete batching plants.

Emissions for aggregate storage piles depend largely on the size (acreage) of the facility and on Thornthwaite's precipitation-evaporation (PE) index. The Thornthwaite's PE index indicates the potential of soil or aggregate particles to dry and be removed from a surface. The PE index is higher (wetter) for the Texas/New Mexico region than for the Nevada and Utah region indicating that the fugitive dust potential from aggregate storage piles is greater in the Nevada/Utah region. Aggregate storage pile emissions are the only emission factors in this section that provide compensation for geographic variability. However, the PE index and other geographic variability, such as wind speed, will affect emission rates for the other construction activities discussed here to an undetermined degree.

Aggregate base, bituminous surface, and concrete materials required for each construction mode are listed previously in Table 4.1.2.1.3-2. Materials handled are multiplied by emission rates in summary Tables 4.1.1-5, 4.1.2.1.3-3 and 4.1.2.1.3-4 to derive M-X-specific emission rates.

Emission rates for each construction group were calculated, assuming that each group will have one plant of each type to handle all of the materials needed for that construction group and would store 100 percent of the aggregate-base material in piles in the area of the plants.

Particulate-size data for emissions estimates are known only for aggregate storage pile emissions. There is no data on particle size distributions for the remaining emission sources discussed here. Distribution of particle sizes varies depending on the particle-size distribution of the materials used and other factors.

Table 4.1.2.1.3-2. **Materials assumed for emission estimates from road and shelter material processing.***

MATERIALS	CLUSTER ROADS		DTN's		SHELTERS	
	PER MILE	TOTAL (7,000 MILES)	PER MILE	TOTAL (1,380 MILES)	PER SHELTER	TOTAL 4,600 SHELTERS
Aggregate Base (cy)	0.94E+04	0.66E+08	0.82E+04	0.11E+08	0	0
Bituminous surfacing (tons)	0	0	0.51E+04	0.70E+07	0	0
Concrete	0	0	0	0	0.13E+04	0.59E+07

1054-1

*Materials estimates were derived using the 100 percent Nevada/Utah loop alternative with 6,000 ft spacing between shelters. Critical factors for the purposes of deriving emissions estimates do not vary significantly for average construction groups for most alternatives.

Table 4.1.2.1.3-3. Particulate emissions for stationary sources in the Dry Lake/Delamar construction group: uncontrolled case during highest concentration.

SOURCE	UNCONTROLLED CASE				
	MATERIAL (tons) OR AREA	EMISSION RATE (lb/ton)	TOTAL EMISSIONS (tons)	DAILY EMISSION RATE (tons/day)	EMISSION RATE (g/sec)
Shelters (282 days)					
Sand and Gravel Processing	2.99E + 05	0.1[1]	14.95	0.053	0.67
Stone Quarrying and Processing	2.99E + 05	1.6[2]	231.73	0.822	25.88
Concrete Batching Plants	2.99E + 05[4]	0.2[3]	29.9	0.101	3.34
DTN					
No construction during this period.					
Clusters (216 days)					
Sand and Gravel Processing	3.455E + 06	0.1[1]	172.75	0.799	25.19
Stone Quarrying and Processing	3.455E + 06	0.4[5]	691.00	3.199	100.77
Aggregate and Storage Piles					
8 a.m. to 4 p.m.	30 acres	—	—	7.20	226.9
8 a.m. to 4 p.m. (wind erosion only)	30 acres	—	—	2.02	32.0

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[1]Same as reasonable case rate.

[2]Stone quarrying and processing for shelters involves primary crushing, secondary crushing, recrushing and screening. Emission rates for these processes range from 0.1 to 2.5 lb per ton of material.

[3]Value is in lb/yd (1 yd^3 approximately equal to 2 tons).

[4]Value is in yd^3.

[5]Stone quarrying and processing for clusters involves primary crushing and secondary screening. Emission rates for these processes range from 0.1 to 0.6 lb per ton of material.

Table 4.1.2.1.3-4. Particulate emissions for stationary sources: probable case during highest construction activity.

SOURCE	PROBABLE CASE				
	MATERIAL (tons or Area)	EMISSION RATE (lb/ton)	TOTAL EMISSIONS (tons)	DAILY EMISSION RATE (tons/day)	EMISSION RATE (g/sec)
Shelters (282 days)					
Sand and Gravel Processing	2.99E + 05	0.1[1]	14.95	0.053	1.67
Stone Quarrying & Processing	2.99E + 05	0.4[2]	59.80	0.212	6.68
Concrete Batching Plants	2.99E + 05[4]	0.11[3]	16.45	0.058	1.84
DTN					
No construction during this period.					
Clusters (216 days)					
Sand and Gravel Processing	3.455E + 06	0.1[1]	172.75	0.799	25.19
Stone Quarrying and Processing	3.455E + 06	0.1[5]	172.75	0.799	25.19
Aggregate Storage Piles[6]					
8 am to 4 pm	30 acres	—	—	4.32	136.3 / 196.9
Aggregate Storage Piles[7] 4 pm to 8 am (wind erosion only)	30 acres	—	—	0.81	12.8

3496-1

[1]Same as uncontrolled rate.

[2]75% effective control (w/cyclone); reduces emissions from 1.6 to 0.4 lb per ton of material

[3]Control between 0.2 and 0.02 lb/yd possible; 50% control assumed.

[4]Value is in yd^3 (1 yd approximately equal to 2 tons)

[5]75% effective control reduces emissions from 0.4 to 0.1 lb/ton

[6]40% effective control possible (uncontrolled rate = 226.9 gs^{-})

[7]60% effective control possible (uncontrolled rate = 32.0 gs^{-})

Total daily particulate emission rates for the local production, processing, and excavation of materials at the Dry Lake/Delamar construction camp are given in Tables 4.1.2.1.3-3 and 4.1.2.1.3-4 for probable case and worst case conditions. The "probable" case emissions represent effective control techniques applied to aggregate storage piles, asphaltic concrete plants, and concrete batching plants. "No control" case represents uncontrolled emissions for aggregate storage piles, asphaltic concrete plants, and concrete batching plants. Sand and gravel processing plant emissions are the same for both cases. PE index for both emissions estimates are for the Nevada/Utah region (conservative value). Dry Lake/Delamar emission estimates are presented as representative emission rates for most construction groups.

Again, the particulate-size distribution of the emissions will vary. All aggregate storage pile emissions are for particles less than 30m in diameter. Particles smaller than 30m are considered to remain suspended indefinitely. Aggregate storage pile emissions range from 30 to nearly 100 percent of the total emissions for any given construction mode.

Shelter and cluster road construction run concurrently for a time. Therefore, a cumulative worst-case emission rate will occur when shelter construction daily emissions are added to cluster construction daily emissions during the overlapping period. DTN construction emissions are expected to be emitted exclusively during the approximately seven-month period prior to cluster road or shelter road construction start-up and after completion of the shelters and cluster roads.

<u>Aggregate Storage Operations</u> (4.1.2.1.4)

Assume a 30-acre facility:

1) based upon normal activity emission factor (5 days a week): Guideline Series, 1977, Fugitive Dust:

$$\text{Emission Factor}^* = \frac{10.4}{\left(\frac{PE}{100}\right)^2} = \frac{10.4}{\left(\frac{13}{100}\right)^2} = 615.4 \ \frac{\text{lb}}{\text{day-acre}}$$

2) Daily emissions

$$615.4 \ \frac{\text{lb}}{\text{day-acre}} \times 30 \text{ acres} = 18{,}462 \ \frac{\text{lb}}{\text{day}}$$

3) Emissions 8:00 a.m. - 4:00 p.m.

<u>(Percent of Total Emissions)**</u>

loading	12%	= 67% (8:00 a.m. to 4:00 p.m. only) = $\frac{12{,}369.5 \text{ lb}}{8 \text{ hr}}$	= 1,546.2 lb/hr
unloading	15%		
vehicles	40%	= 1.37% per hour (24 hrs/day) = $\frac{2{,}023.4 \text{ lb}}{8 \text{ hr}}$	= 252.9 lb/hr
erosion	33%		
		total	= 1,799.1 lb/hr

4) Emissions 4:00 p.m. - 8:00 a.m.
erosion only = 1.37% per hour (24 hrs/day) = $\frac{4{,}046.9 \text{ lb}}{16 \text{ hr}}$ = 252.9 lb/hr

*PE = Precipitation - Evaporation
**Reference: from Table 1.1.2.3-1 in AP-42

5) Emission rates (g/sec)

8:00 a.m. - 4:00 p.m. = 1,799.1 lb/hr x $\frac{1 \text{ hr}}{3600 \text{ sec}}$ x $\frac{454 \text{ g}}{\text{lb}}$ = 226.9 gm/sec

4:00 p.m. - 8:00 a.m. (only wind erosion emissions):

$$252.9 \text{ lb/hr} \times \frac{1 \text{ hr}}{3600 \text{ sec}} \times \frac{454 \text{ g}}{\text{lb}} = 32.0 \text{ gm/sec}$$

Wind Erosion from Exposed Surface (4.1.2.1.5)

The basic equation used to calculate wind erosion losses as given in OAQPS Guideline Series No. 1.2-071, October, 1977 is:

$$E_s = AIKCL'V'$$

where:

E_s	=	suspended articulate fraction of wind erosion losses, tons/acre/year
A	=	portion of total wind erosion losses that would be measured as suspended particulate
I	=	soil erodibility, tons/acre/year
K	=	surface roughness factor
C	=	climatic factor
L'	=	unsheltered field width factor
V'	=	vegetative cover factor

The OAQPS Guideline Series suggests a value of 0.038 for Variable A as typical of disturbed native soil. The EPA report, "Investigation of Fugitive Dust - Sources, Emissions and Control," May, 1973 prepared by PED CO assumes that an average of 2.5 percent of wind erosion soil losses become suspended particulates.

Variable I, the erodibility index, has been determined for the Nevada/Utah area and the Texas/New Mexico area using maps of soil type and a table of erodibility index given in the EPA report, "Development of Emissions Factors for Fugitive Dust Sources," June 1974. The soils of the Nevada/Utah deployment area are mainly arid with clay and alkali or carbonate accumulation. However, the soil texture classification may range from predominately silt, as found in the playas, to all sand, as found in some sand dune areas. This range of soil textures presents a spread of erodibility index from 40 to 220. The end values of this spread are localized extremes and not truly representative of the system construction zones. A more appropriate range of values would be 50 to 130, covering texture classes which vary from silt loams to medium grained sands.

The types of soil found in Texas/New Mexico are semiarid loams, loamy sands, shallow clay loam deposits on bedrock, and arid soils with clay and alkali or carbonate accumulation. These soil types are representative of texture erodibility index ranging from 35 - 150.

The surface roughness factor, K, denotes the resistance to wind erosion by ridges of given heights and spacings compared to a standard ridge height-spacing. The factor varies from 1.0 (no reduction) for a field with a smooth surface to a minimum of 0.5 for a field with the optimum ratio of ridge height to spacing.

The climatic factor, C, is calculated as a measure of wind velocity and surface moisture. Soil movement by wind varies directly as the cube of the wind velocity and inversely as the square of the soil surface moisture. The soil moisture varies directly with the amount of precipitation and inversely as the square of the temperature. The wind velocity data is obtained from weather records. P-E indices are used as an index of effective moisture of surface soil particles. The factor C is therefore based on average wind velocity and the P-E index. The wind value is the corrected mean annual wind velocity for a standard height of 30 feet and the P-E is the yearly sum of monthly values determined from precipitation and temperature data. Garden City, Kansas is used as the standard base and the C factor for this area is designated as 100 percent. The expression for finding the C factor for any other geographic location is:

$$C = 0.345 \frac{V^3}{(P\text{-}E)^2}$$

Figure 4.1.2.1.5-1 presents climatic factors for the State of Nevada. The factors in the deployment area range from 300 in the southern portion of the state down to 20 in northcentral Nevada. Climatic factors for the Texas and New Mexico areas of interest range from 50 to 200.

The unsheltered field width, L, is the unsheltered distance across a field or strip in the direction of prevailing erosive winds. Soil flow across an eroding field is directly related to the width of the unprotected area. Soil flow increases across the field in the direction of the wind. When the prevailing wind is across a field or strip at an angle, the distance the prevailing wind travels can be obtained using Figure 4.1.2.1.5-2. The correlation between the width of a field and its rate of erosion is also affected by the soil erodibility of its surface: the more erodible the surface, the shorter the distance in which maximum soil movement is reached. This relationship between the unsheltered width of a field, L, its surface erodibility, IK, and its relative rate of soil erosion, L', is shown graphically in Figure 4.1.2.1.5-3.

If Figure 4.1.2.1.5-3 is used to obtain the L' factor, values for the variable I and K must already be known and an appropriate value for L must be determined. L can be determined for several different field widths depending on the type of eroding surface being examined. Disturbed land area around a shelter construction site is assumed to cover approximately 7.5 acres during construction and 2.0 acres during operation. DTN roads are assumed to have a disturbed surface width of 74 ft, while that of cluster roads is approximately 46 ft. The unsheltered distance factor, L', for a given surface in the prevailing wind direction varies continually. To assess an average effective distance factor, it may be assumed that in the long term, wind direction is equally disturbed for all surfaces. Any error attributed to this assumption would be minimized by the more probable assumption that the surfaces are equally distributed in terms of orientation.

If it is assumed that the eroding surfaces are essentially flat surfaces with a maximum K value of 1.0, then the IK value would range from 50 to 130 for the Nevada/Utah area, and from 35 to 150 for the Texas/New Mexico area. The average values of L' for surfaces of specified erodibility IK, are shown in Tables 4.1.2.1.5-1 through 4.1.2.1.5-4.

The vegetative cover factor, V', is a measure of the type, quantity and orientation of residue on a field which will reduce soil wind erosion loss. The degree

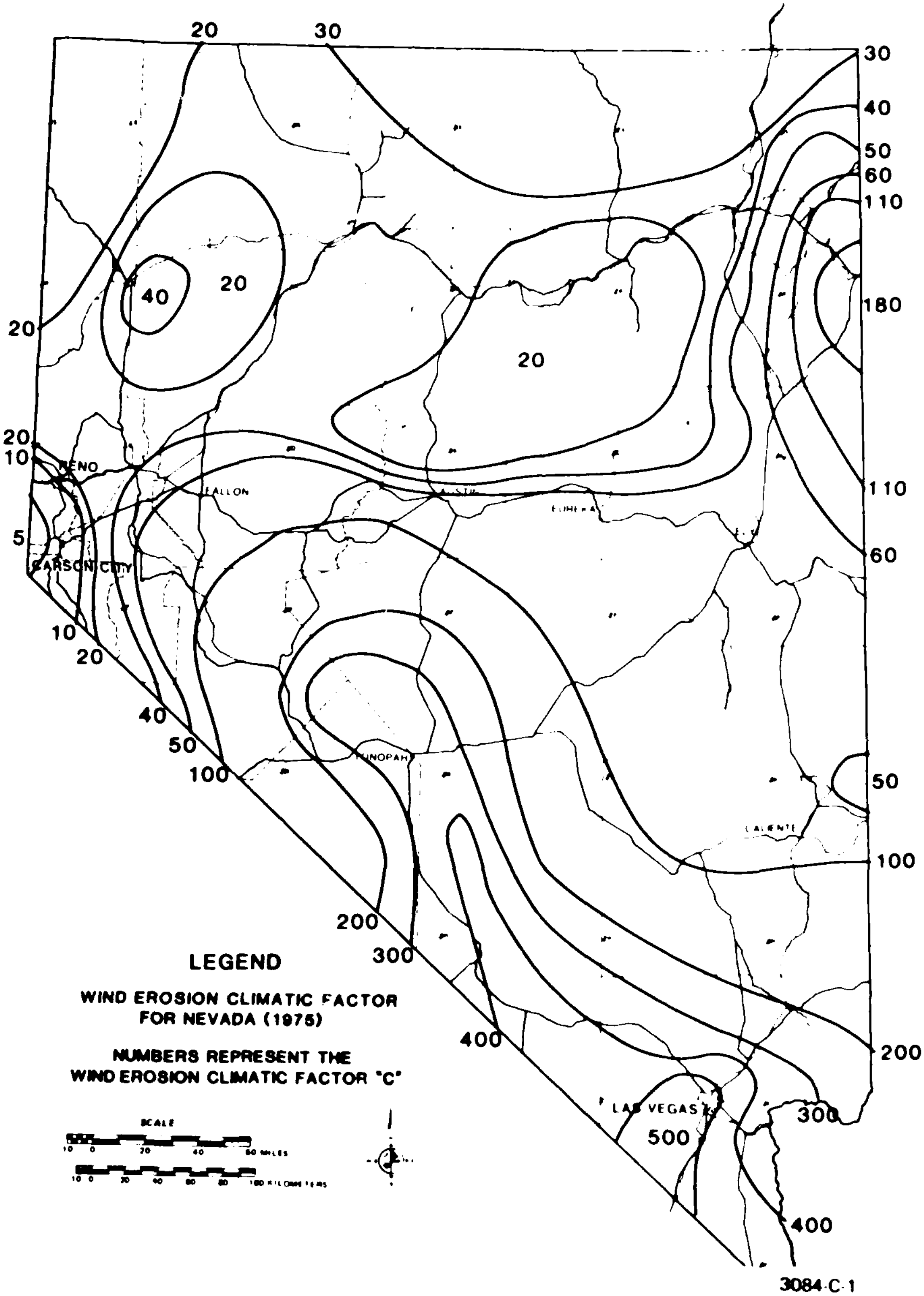

Figure 4.1.2.1.5-1. Wind erosion climatic factor in Nevada (1975).

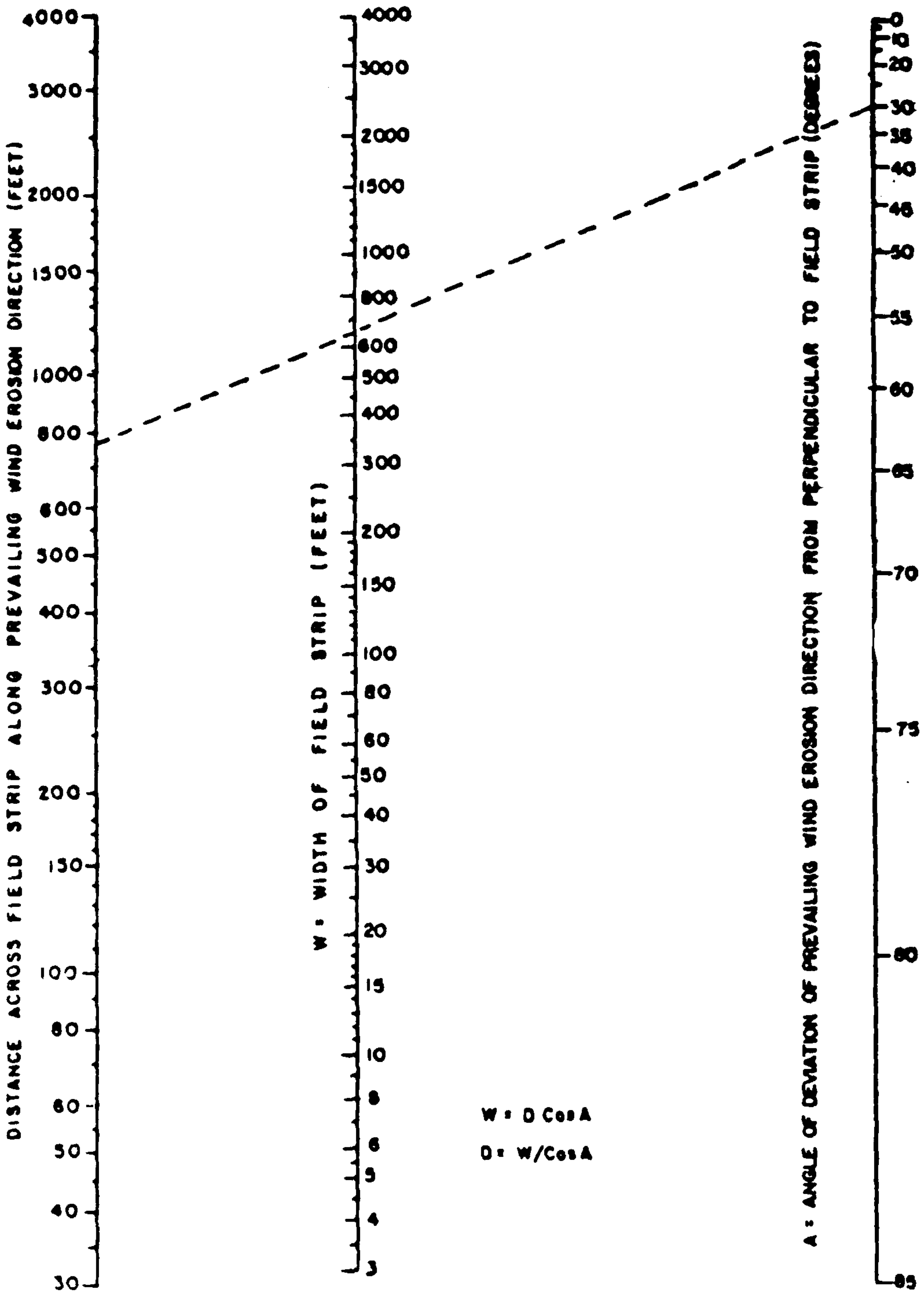

Figure 4.1.2.1.5-2. Alignment chart to determine: (1) Distance across field strip along the prevailing wind erosion direction from width of field strip and prevailing wind erosion direction, (2) width of field strip from prevailing wind erosion direction and distance across field strip along prevailing wind erosion direction.

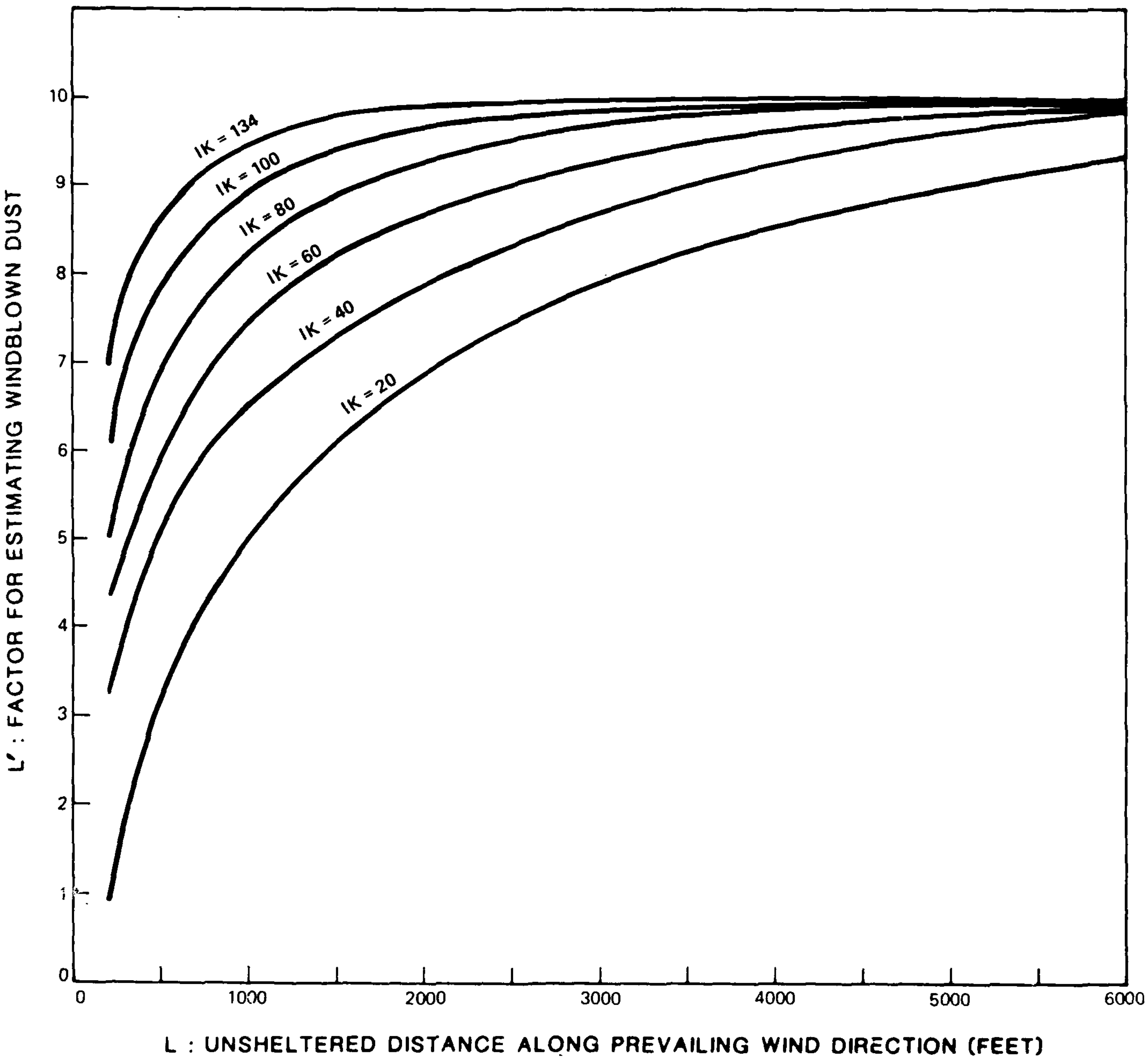

Figure 4.1.2.1.5-3. Effect of field length on relative emission rate.

Table 4.1.2.1.5-1. Unsheltered field width factor L' for 7.5-acre plot.

IK	L' AT DIFFERENT PREVAILING WIND DIRECTIONS				AVERAGE L'
	$\theta = 90^o$	$\theta = 60^o$	$\theta = 30^o$	$\theta = 0^o$	
35	0.50	0.53	0.64	1.0	0.67
50	0.58	0.62	0.72	1.0	0.73
130	0.87	0.89	0.95	1.0	0.93
150	0.94	0.96	0.99	1.0	0.97

3493

Table 4.1.2.1.5-2. Unsheltered field width factor L' for 2.0-acre plot.

IK	L' AT DIFFERENT PREVAILING WIND DIRECTIONS				AVERAGE L'
	$\theta = 90^o$	$\theta = 60^o$	$\theta = 30^o$	$\theta = 0^o$	
35	0.35	0.38	0.52	1.0	0.56
50	0.45	0.48	0.59	1.0	0.63
130	0.77	0.80	0.88	1.0	0.86
150	0.85	0.88	0.94	1.0	0.92

3492

Table 4.1.2.1.5-3. Unsheltered road distance factor L' for 46 ft. wide cluster road.

IK	L' AT DIFFERENT PREVAILING WIND DIRECTIONS				AVERAGE L'
	θ = 90°	θ = 60°	θ = 30°	θ = 0°	
35	0.05	0.06	0.11	1.0	0.31
50	0.06	0.07	0.16	1.0	0.32
130	0.14	0.15	0.31	1.0	0.40
150	0.16	0.17	0.34	1.0	0.42

3494

Table 4.1.2.1.5-4. Unsheltered road distance factor L' for 74 ft. wide DTN road.

IK	L' AT DIFFERENT PREVAILING WIND DIRECTIONS				AVERAGE L'
	θ = 90°	θ = 60°	θ = 30°	θ = 0°	
35	0.09	0.11	0.18	1.0	0.35
50	0.13	0.15	0.23	1.0	0.38
130	0.23	0.24	0.50	1.0	0.49
150	0.26	0.28	0.55	1.0	0.52

3495

of reduction is related to the other surface erosion variables and V' varies from 1.0 for no cover to 0 for heavy cover (no erosion).

Table 4.1.2.1.5-5 has been prepared to present the range of erosion rates possible in the construction areas of Nevada/Utah and Texas/New Mexico for various sizes and types eroding surfaces. The low rates have been calculated using minimum potential values of I and C, and high rates use maximum values. Factor A is assumed to be equal to 0.025 for the disturbed soil areas, and 0.038 for gravel road surfaces. The eroding surfaces are assumed to be essentially flat and the K value is therefore set to 1.0. The vegetative cover factor will initially be 1.0 after construction and slowly decreases as revegetation takes place. Since specific information on the quantity and quality of revegetation is not available, V' is assumed to remain constant at 1.0.

<u>Construction Emission Rates of Fugitive Dust - PAL Modeling</u> (4.1.2.1.6)

Construction Areas

Assume emission factor 1½ times the AP-42 construction activity rate, since the AP-42 rate is for medium activity level and moderate silt content. M-X construction is assumed to occur at high activity level in areas of varying silt content. A diagram of typical construction areas for which emission rates are calculated below is given (see Figure 4.1.2.1.6-1).

Construction Activity Fugitive Dust (Table 4.1.2.1.6-1)

Emission factor: 1.5 x 1.2 ton of particulates/acre month of activity = 1.8 tons/acre/mo. = 0.0006 $g/sec\text{-}m^2$

Size of construction areas:

1 shelter area = 7.5 acres
1-mile segment of cluster road = 5,280 ft x 100 ft = 12.1 acres
1-mile segment of DTN road = 5,280 ft x 125 ft = 15.2 acres

Emission rate for:

$$\text{Shelter} = \frac{1.8\ \text{ton}}{\text{acre-mo}} \times 7.5\ \text{acre} \times \frac{\text{mo.}}{22\ \text{day}} \times \frac{\text{day}}{8\ \text{hr}} \times \frac{\text{hr}}{3600\ \text{sec}} \times \frac{2000\ \text{lb}}{\text{ton}} \times \frac{435.5\text{g}}{\text{lb}}$$

$$= 19.3\ \text{g/sec.}$$

Similarly,
Cluster road = 29.4 g/sec
and,

DTN Road = 39.1 g/sec.

Assumptions:
- o 22 construction days per month
- o 8 construction hours per construction day
- o 100-ft wide section disturbed for cluster road construction
- o 125-ft wide section disturbed for DTN road construction

Table 4.1.2.1.5-5. Suspended particulate erosion rates, E_s, in tons/acre/year.

SYSTEM ACTIVITY	EROSION AREA TYPE	NEVADA/UTAH		TEXAS/NEW MEXICO	
		I = 50 C = 20	I = 130 C = 300	I = 35 C = 50	I = 150 C = 200
Construction	Shelter 7.5 acres	L^1 = 0.73 E_S = 18.3	L^1 = 0.93 E_S = 18.3	L^1 = 0.67 E_S = 906.8	L^1 = 0.97 E_S = 727.5
Construction	DTN Road 74 ft. x 1 mi.	L^1 = 0.38 E_S = 14.4	L^1 = 0.49 E_S = 726.2	L^1 = 0.35 E_S = 23.3	L^1 = 0.52 E_S = 592.8
Construction and Operation	Cluster Road 46 ft. x 1 mi.	L^1 = 0.32 E_S = 12.2	L^1 = 0.40 E_S = 592.8	L^1 = 0.31 E_S = 20.6	L^1 = 0.42 E_S = 478.8
Construction	OB Const. Area 60 acres	L^1 = 1.0 E_S = 25.0	L^1 = 1.0 E_S = 975.0	L^1 = 1.0 E_S = 43.8	L^1 = 1.0 E_S = 750.0
Construction	OB Const. Area 100 acres	L^1 = 1.0 E_S = 25.0	L^1 = 1.0 E_S = 975.0	L^1 = 1.0 E_S = 43.8	L^1 = 1.0 E_S = 750.0
Operation	Shelter 2.0 acres	L^1 = 0.63 E_S = 15.8	L^1 = 086 E_S = 838.5	L^1 = 0.56 E_S = 24.5	L^1 = 0.92 E_S = 690.0

4156

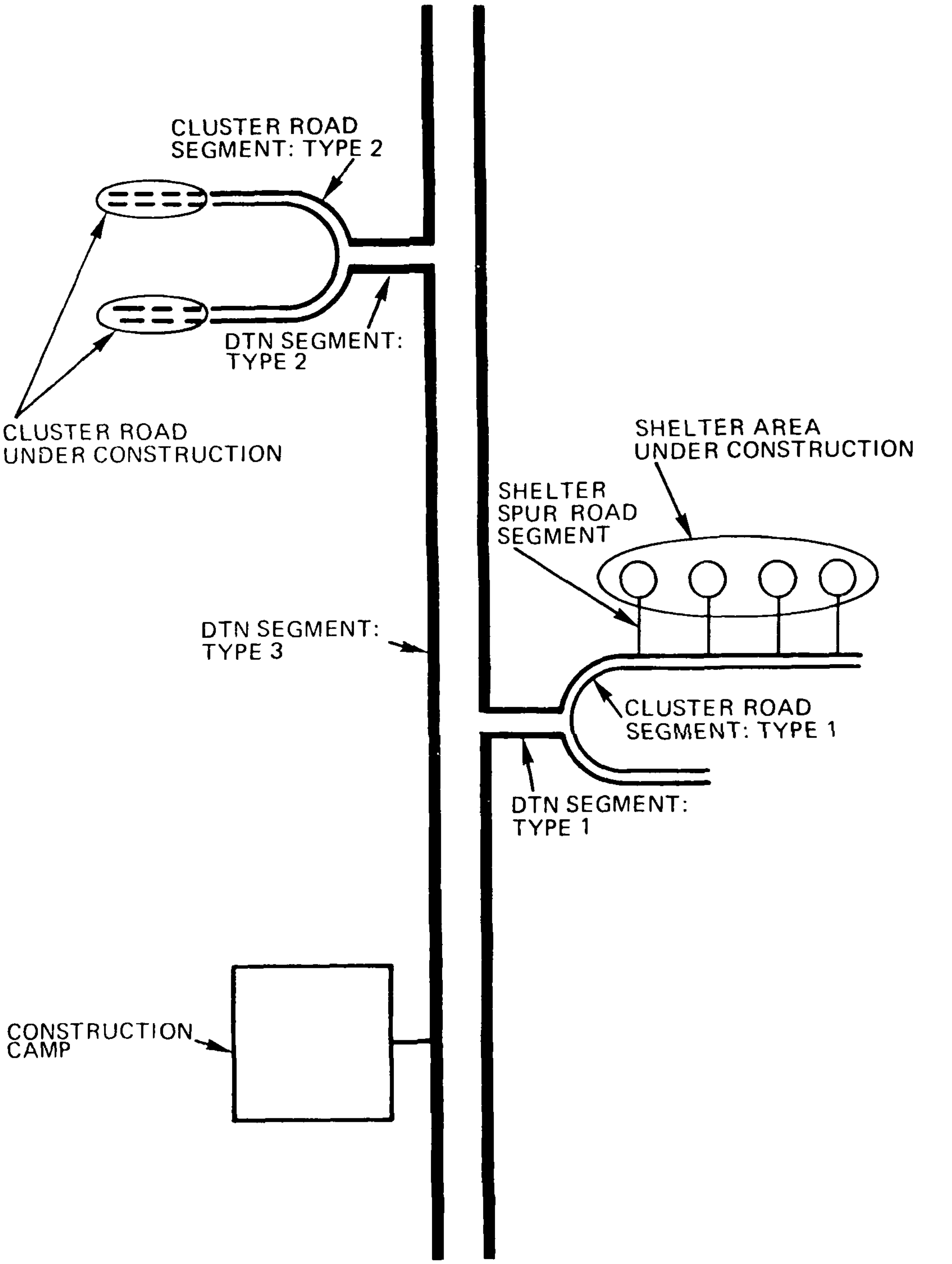

Figure 4.1.2.1.6-1. Diagram of road segments analyzed for PAL modeling.

Table 4.1.2.1.6-1. Summary of vehicular fugitive dust emissions in the deployment area during construction of the shelters and cluster roads.

TYPE	WORST (g/sec/meter)	PROBABLE	MITIGATED
Shelter spur road	0.0180	0.0102	0.0051
Cluster road (Type 1)	0.0741	0.0420	0.0210
Cluster road (Type 2)	0.1326	0.0752	0.0376
DTN (Type 1)	0.0741	0.0420	0.0210
DTN (Tupe 2)	0.2639	0.1496	0.0748
DTN (Type 3)	0.4062	0.2303	0.1152

3510-1

Probable = worst x (0.567) - using emission factor of 0.0064 ton/vehicle-mi.

Mitigated = probable x (0.5).

Vehicular Road Dust on the Roads to Construction Areas

1-mile segment of shelter spur road

- o This is a road segment which connects the shelter construction area to the cluster road system
- o Peak daily vehicle flow over segment (based on equipment estimates for shelter construction)

Emission rates (g/sec, averaged over an 8-hour day)

1 - 32/ton truck trip per day	0.101	
25 concrete truck trips per day	0.840	
1 semi-truck trip per day	0.101	
20-passenger vehicle trips per day	0.448	
	1.490	ton/day = 46.9 g/sec
		= .0291 g/sec/m

Assumption:

- o One shelter area will handle 1 concrete truck approximately every 20 minutes

1-mile segment of cluster road (TYPE 1)

- o this is a completed cluster road segment which handles traffic flow from the shelter construction areas out to the main DTN network.
- o Peak daily vehicle flow over segment (based on equipment estimated for shelter construction)

Emission rates (g/sec, averaged over an 8-hour day)

Three 32-ton truck trips per day	0.303	
100 concrete truck trips per day	3.360	
Two semi-truck trips per day	0.202	
100 passenger vehicle trips per day	2.240	
	6.105	ton/day = 192.3 g/sec
		= .1195 g/sec/m

Number of concrete truck trips per day for shelter construction has been estimated from materials use figures for a typical construction group as follows:

$$\frac{2.99 \times 10^5 \text{ cy of concrete}}{\text{shelter construction period}} \times \frac{\text{shelter construction period}}{282 \text{ days}} \times \frac{\text{concrete truck}}{12 \text{ cy}}$$

= 88 concrete truck trips/day (average rate)

Assume 4 shelters under simultaneous construction with 25 trips per day to each and a peak total flow of 100 trips/day:

1-mile segment of cluster road (TYPE 2)

- o This is a completed segment of cluster road which handles traffic from the active cluster road construction area to the main DTN network.

- Peak daily vehicle flow over segment (based on equipment estimates for cluster road construction):

2 tank truck trips per day	0.179
200 off-road truck trips per day	8.960
1 semi-truck trip per day	0.101
75 passenger vehicle trips per day	1.680
	10.920 ton/day = 344.0* g/sec
	= .2138 g/sec/m

*Emission rate is based on a worst-case emission factor of 0.0112 ton/vehicle mile for suspended dust only - multiply all numbers by 0.62:

- number of off-road truck trips per day for cluster road construction has been estimated from materials use figures for a typical construction groups as follows:

$$\frac{3.29 \times 10^6 \text{ cy of aggregate}}{\text{construction period cluster}} \times \frac{\text{cluster construction period}}{216 \text{ days}} \times \frac{\text{off-road truck}}{40 \text{ cy}}$$

= 380 off-road truck trips/day (average rate)

- Assume that there are two separate cluster road construction areas operating simultaneously with a peak daily flow of 200 trips/day in each.

1-mile segment of DTN road (TYPE 1)

- This is a spur segment of DTN road which handles traffic from the shelter construction areas to the main DTN network (could also be the main network segment with no other traffic).
- Emission rates and assumptions are same as for "cluster road segment - TYPE 1" = 192.3 g/sec.

1-mile segment of DTN road (TYPE 2)

- This is a spur segment of DTN road which handles traffic from the cluster road construction areas to the main DTN network (could also be a main network segment with no other traffic).
- Traffic flow on this segment is essentially a doubling of "cluster road segment - TYPE 2" traffic, except that tank truck trips and semi-truck trips are limited by the vehicle allocation numbers.

o Peak daily flow over DTN segment (TYPE 3)

Three 32-ton truck trips per day	0.303
3 tank truck trips per day	0.269
4 semi-truck trips per day	0.404
100 concrete truck trips per day	3.360
400 off-road truck trips per day	17.920
500 passenger vehicle trips per day	11.200
	33.456 ton/day = 1054.0 g/sec
	= .6551

(Emission rate is based on a worst-case emission factor of 0.0112 ton/vehicle mile for suspended dust only - multiply all numbers by 0.62.)

NOTE: Peak daily flows for all previous line source segments do not include watering vehicles. All emission rates for road segments are based on a worst-case emission factor of 0.0112 ton/vehicle-mi. No mitigations have been applied. Addition of watering trucks and other personnel vehicles to DTN segment flows could increase vehicle numbers and emission rates by factor of 6. Application of mitigation measures could reduce emission rates on DTNs by a factor of 10.

Combustion-Related Vehicular Emissions (4.1.2.2)

Fuel emissions from M-X construction activities were examined as potential sources of air quality degradation. The pollutants of concern emitted by combustion processes are particulates, carbon monoxide, nitrogen oxides, sulfur dioxide, and hydrocarbons. In addition, ozone and other oxidant pollutants are formed when nitrogen oxides and hydrocarbons react photochemically in the presence of sunlight.

The major source of the fuel emissions associated with the construction activities is the operation of heavy-duty diesel-powered vehicles. Emission factors for various types of heavy-duty diesel-powered construction equipment have been determined by the EPA (1976) and are listed in Table 4.1.2.2-1. The factors listed for each pollutant type are given in units of tons of pollutants emitted per hour of vehicle operation. A normal construction day is assumed to be eight hours. The total number of construction days as well as the number and types of vehicles to be used can be determined from the construction schedule (Table 4.1.1-1) and equipment usage lists (Tables 4.1.1-2 through 4.1.1-4). The construction schedule presented is for full deployment in Nevada/Utah with initial construction effort commencing in group No. 11. Maximum daily equipment use is assumed to be similar for any given group area regardless of the system deployment alternative. Daily emission rates for each pollutant and vehicle type can be determined by multiplying the emission factor (from Tables 4.1.2.2-1 and 4.1.2.2-2) times the number of vehicles times the hours of operation. The daily emission rate is then multiplied by the total number of construction days to yield the total amount of emissions (Table 4.1.2.2-3 through 4.1.2.2-17).

The emissions from other vehicles used to support the construction activities (semi-trailers, carry-alls, water trucks, etc.) can be calculated in the same manner using the emission factors listed in Table 4.1.2.2-2. The factors listed are mean

Table 4.1.2.2-1. Emission factors for diesel-powered construction equipment. From EPA (1976).

TYPE OF CONSTRUCTION EQUIPMENT	POLLUTANT EMISSION FACTOR				
	CO (TONS/HR x 10^{-5})	EXHAUST HYDROCARBONS (TONS/HR x 10^{-5})	NO_x (TONS/HR x 10^{-5})	SO_x (TONS/HR x 10^{-5})	PARTICULATES (TONS/HR x 10^{-5})
Tracklaying Tractor	19.3	5.5	73.5	6.8	5.6
Wheeled Tractor	107.5	7.4	49.7	4.5	6.8
Wheeled Dozer	36.9	11.7	252.5	17.4	8.2
Scraper	73.0	31.3	311.0	23.1	20.3
Motor Grader	10.7	2.7	52.5	4.3	3.0
Wheeled Loader	27.6	9.3	120.0	9.1	8.6
Tracklaying Loader	8.0	1.6	29.2	3.8	2.9
Off-Highway Truck	67.0	21.8	381.5	22.7	12.8
Roller	9.2	2.7	52.0	3.3	2.5
Miscellaneous	20.7	7.8	113.5	7.1	6.9

1019

Table 4.1.2.2-2. Emission factors[a] for automobiles and trucks-based on 1975 Federal Testing Procedures (FTP) standard conditions. EPA (1976).

VEHICLE TYPE	POLLUTANT EMISSION FACTOR				
	CO (TONS/MI x 10^{-5})	HYDROCARBONS[b] (TONS/MI x 10^{-5})	NO_x (TONS/MI x 10^{-5})	SO_x (TONS/MI x 10^{-5})	PARTICULATES[c] (TONS/MI x 10^{-5})
Gasoline-powered, Light-Duty Vehicle (Automobile)	3.54	0.31	0.25	0.01	0.06
Gasoline-powered, Light-Duty Truck <6000 lbs.	4.43	0.39	0.25	0.02	0.06
Gasoline-powered, Light-Duty Truck 6001-8500 lbs.	4.47	0.39	0.25	0.02	0.06
Gasoline-powered, Heavy-Duty Vehicle (Buses and Trucks)	24.94	1.12	1.00	0.04	0.14 + 0.02 (W/4)
Diesel-powered, Heavy-Duty Vehicle (Buses and Trucks)	2.98	0.50	2.19	8.31	0.14 + 0.02 (W/4)

1020

[a]Emission factors are for 1982 calendar year assuming 1979 vehicle models. Emission factors for 1979 models have been projected from test data prior to 1976. Not valid for high altitude areas.

[b]Includes exhaust, evaporative, and crankcase hycrocarbons.

[c]Includes both exhaust and tire wear. An adjustment is made for trucks with more than 4 tires. W equals the number of tires.

Table 4.1.2.2-3. TSP emissions associated with DTN construction

1 SEGMENT NUMBER	2 VEHICLE TYPE[†]	3 NUMBER OF VEHICLES	4 DISTANCE TRAVELED mi/day (km/day) OR OPERATING TIME hr/day	5 EMISSION FACTOR x 10^{-5} tons/mi (tonnes/km) OR tons/hr (tonnes/hr)	6 NUMBER OF CONSTRUCTION DAYS	7 EMISSIONS PER DAY x 10^{-2} tons (tonnes) (3.) x (4.) x (5.)	8 TOTAL EMISSIONS tons (tonnes) (3.) x (4.) x (5.) x (6.)
1	Spray truck	2	20 (12)	0.23 (0.34)	586	0.01 (0.01)	[illegible]
	Semi	1	500 (311)	0.24 (0.35)	586	0.12 (0.11)	[illegible]
	Tank truck	3	500 (311)	0.23 (0.34)	586	0.35 (0.32)	[illegible] (1.8)
	Water Truck	170	160 (99)	0.23 (0.34)	586	6.26 (5.68)	36.7 [illegible]
	Carry all	3	20 (12)	0.03 (0.04)	586	0.00 (0.00)	[illegible]
	30-ton truck	32	240 (149)	0.24 (0.35)	586	1.84 (1.67)	[illegible]
	Off road truck	39	8	12.8 (11.6)	586	3.99 (3.62)	[illegible]
	D-5 dozer	17	8	8.25 (7.48)	586	1.12 (1.02)	[illegible]
	12-G grader	44	8	3.05 (2.77)	586	1.07 (0.97)	[illegible]
	Backhoe	3	8	8.60 (7.80)	586	0.21 (0.19)	[illegible]
	641-B scraper	23	8	20.30 (18.41)	586	3.74 (3.39)	[illegible]
	Compactor	50	8	2.50 (2.27)	586	[illegible] (0.91)	[illegible]
	Pipelayer	3	8	6.95 (6.30)	586	0.17 (0.15)	[illegible]
	Paver	4	8	2.50 (2.27)	586	0.06 [illegible]	[illegible]
	Roller	8	8	2.50 (2.27)	586	[illegible] (0.15)	[illegible]
Sub-Total		402				[illegible]	[illegible]
2	Spray truck	2	20 (12)	0.23 (0.34)	564	[illegible]	[illegible]
	Semi	1	500 (311)	0.24 (0.35)	564	[illegible]	[illegible]
	Tank truck	3	500 (311)	0.23 (0.34)	564	[illegible]	[illegible]
	Water truck	130	160 (99)	0.23 (0.34)	564	4.79 (4.34)	[illegible]
	Carry all	3	20 (12)	0.03 (0.04)	564	[illegible]	[illegible]
	30-ton truck	24	240 (149)	0.24 (0.35)	564	1.38 (1.25)	[illegible]
	Off road truck	31	8	12.80 (11.60)	564	[illegible] (2.88)	[illegible]
	D-5 dozer	13	8	8.25 (7.48)	564	0.86 (0.78)	4.8 (4.4)
	12-G grader	34	8	3.05 (2.77)	564	[illegible]	4.7 [illegible]
	Backhoe	2	8	8.60 (7.80)	564	0.14 (0.13)	[illegible]
	641-B scraper	18	8	20.30 (18.41)	564	2.92 (2.65)	[illegible]
	Compactor	38	8	2.50 (2.27)	564	0.76 (0.69)	[illegible]
	Pipelayer	2	8	6.95 (6.30)	564	[illegible]	[illegible]
	Paver	3	8	2.50 (2.27)	564	[illegible]	[illegible]
	Roller	6	8	2.50 (2.27)	564	[illegible]	[illegible]
Sub-Total		310				15.61 (14.16)	[illegible]
3	Spray truck	2	20 (12)	0.23 (0.34)	586	0.01 (0.01)	[illegible]
	Semi	1	500 (311)	0.24 (0.35)	586	0.12 (0.11)	[illegible]
	Tank truck	3	500 (311)	0.23 (0.34)	586	0.35 (0.32)	[illegible]
	Water truck	149	160 (99)	0.23 (0.34)	586	1.80 (1.63)	[illegible]
	Carry all	3	20 (12)	0.03 (0.04)	586	0.00 (0.00)	[illegible]
	30-ton truck	27	240 (149)	0.24 (0.35)	586	1.56 (1.41)	[illegible]
	Off-road truck	34	8	12.80 (11.60)	586	3.48 (3.16)	[illegible] (18.5)
	D-5 dozer	15	8	8.25 (7.48)	586	0.99 (0.90)	5.8 (5.3)
	12-G grader	39	8	3.05 (2.77)	586	0.95 (0.86)	5.6 [illegible]
	Backhoe	2	8	8.60 (7.80)	586	0.14 (0.13)	0.8 [illegible]
	641-B scraper	20	8	20.30 (18.41)	586	3.25 (2.95)	[illegible]
	Compactor	44	8	2.50 (2.27)	586	0.88 (0.80)	5.2 [illegible]
	Pipelayer	2	8	6.95 (6.30)	586	0.11 (0.10)	0.7 (0.6)
	Paver	3	8	2.50 (2.27)	586	0.06 (0.05)	0.4 (0.4)
	Roller	7	8	2.50 (2.27)	586	0.14 (0.13)	0.8 [illegible]
Sub-Total		351				13.84 (12.55)	[illegible] (73.6)
4	Spray truck	2	20 (12)	0.23 (0.34)	500	0.01 (0.01)	0.0 (0.0)
	Semi	1	500 (311)	0.24 (0.35)	500	0.12 (0.11)	0.6 (0.5)
	Tank truck	3	500 (311)	0.23 (0.34)	500	0.35 (0.32)	1.7 (1.5)
	Water truck	158	160 (99)	0.23 (0.34)	500	5.81 (5.27)	29.1 (26.4)
	Carry all	3	20 (12)	0.03 (0.04)	500	0.00 (0.00)	[illegible]
	30-ton truck	29	240 (149)	0.24 (0.35)	500	1.67 (1.51)	8.4 (7.6)
	Off-road truck	36	8	12.80 (11.60)	500	3.69 (3.35)	18.4 (16.7)
	D-5 dozer	16	8	8.25 (7.48)	500	1.06 (0.96)	5.3 (4.8)
	12-G grader	41	8	3.05 (2.77)	500	1.00 (0.91)	5.0 (4.5)
	Backhoe	3	8	8.60 (7.80)	500	0.21 (0.19)	1.0 (0.9)
	641-B scraper	21	8	20.30 (18.41)	500	3.41 (3.09)	17.1 (15.5)
	Compactor	46	8	2.50 (2.27)	500	0.92 (0.83)	4.6 (4.2)
	Pipelayer	3	8	6.95 (6.30)	500	0.17 (0.15)	0.8 (0.7)
	Paver	4	8	2.50 (2.27)	500	0.08 (0.07)	0.4 (0.4)
	Roller	7	8	2.50 (2.27)	500	0.14 (0.13)	0.7 (0.6)
Sub-Total		373				18.64 (16.91)	93.1 (84.4)
Total		1,436				68.21 (61.87)	380.4 (345.0)

[†]All vehicles are diesel powered except carry-alls.

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Table 4.1.[illegible]-4. TSP emissions associated with cluster road construction

Segment Number	Vehicle Type	Number of Vehicles	Distance Traveled* mi/day (km/day) or Operating Time hr/day	Emission Factor tons/mi (tonnes/km) or tons/hr (tonnes/hr)	Number of Construction Days	Emissions per Day tons (tonnes) [illegible] x 4 x [illegible]	Total Emissions tons (tonnes) [illegible] x 4 x 5 x 6
[illegible]	Semi	[illegible]	[illegible]	.24 [illegible]	[illegible]	.24 [illegible]	[illegible]
	Tank truck	[illegible]	[illegible]	[illegible] .34	[illegible]	[illegible]	4 [illegible]
	Water truck	[illegible]	[illegible] 99	[illegible] .34	[illegible]	[illegible]	46 [illegible]
	Carry-all	[illegible]	[illegible]	[illegible] .04	[illegible]	[illegible]	[illegible]
	Off-road truck	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	46 [illegible]
	641-B scraper	[illegible]	[illegible]	[illegible] 18.41	[illegible]	[illegible]	15 [illegible]
	D-5 dozer	[illegible]	8	[illegible] 7.48	[illegible]	[illegible]	[illegible]
	12-G grader	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Backhoe	[illegible]	8	[illegible]	[illegible]	.04 [illegible]	4 [illegible]
	Spreader	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Compactor	[illegible]	8	[illegible]	[illegible]	[illegible]	.4 [illegible]
	Pipelayer	[illegible]	[illegible]	[illegible]	[illegible]	.26 [illegible]	[illegible]
Sub-Total		45[illegible]				[illegible]	.44 [illegible]
[illegible]	Semi	[illegible]	500 (311)	.24 [illegible]	434	[illegible]	[illegible]
	Tank truck	[illegible]	500 (311)	.23 .34	434	[illegible] .32	[illegible] 2.9
	Water truck	[illegible]	160 (99)	[illegible] .34	434	[illegible]	[illegible] 55.[illegible]
	Carry-all	4	20 (12)	[illegible] .04	434	[illegible]	[illegible]
	Off-road truck	56	8	12.80 (11.60)	434	[illegible]	53.6 (48.6)
	641-B scraper	[illegible]	8	20.30 (18.41)	434	[illegible]	[illegible]
	D-5 dozer	[illegible]	8	8.25 (7.48)	434	.66 [illegible]	6.2 5.6
	12-G grader	[illegible]	8	8.60 (7.80)	434	[illegible]	19.[illegible]
	Backhoe	4	8	2.50 (2.27)	434	.08 [illegible]	[illegible]
	Spreader	1	8	2.50 (2.27)	434	[illegible]	[illegible]
	Compactor	4[illegible]	8	2.50 (2.27)	434	.44 [illegible]	8.6 [illegible]
	Pipelayer	4	8	6.95 [illegible]	434	[illegible]	[illegible]
Sub-Total		346				[illegible]	[illegible]
[illegible]	Semi	[illegible]	500 (311)	.24 [illegible]	826	.24 [illegible]	[illegible] 1.8
	Tank truck	3	500 (311)	[illegible] .34	826	[illegible]	[illegible] 2.6
	Water truck	204	160 (99)	.23 .34	826	[illegible]	[illegible] 56.[illegible]
	Carry-all	5	20 (12)	.03 [illegible]	826	[illegible]	[illegible]
	Off-road truck	[illegible]4	8	12.80 (11.60)	826	6.55 5.94	[illegible] 49.[illegible]
	641-B scraper	[illegible]	8	[illegible] (18.41)	826	1.14 (1.03)	[illegible] 8.5
	D-5 dozer	12	8	8.25 (7.48)	826	[illegible]	[illegible] 5.9
	12-G grader	[illegible]	8	8.60 (7.80)	826	2.41 (2.19)	19.[illegible] 18.[illegible]
	Backhoe	4	8	2.50 (2.27)	826	.08 [illegible]	[illegible] 0.6
	Spreader	1	8	2.50 (2.27)	826	.02 (0.02)	[illegible]
	Compactor	53	8	2.50 (2.27)	826	[illegible]	8.8 8.[illegible]
	Pipelayer	4	8	6.95 (6.30)	826	0.22 [illegible]	1.8 1.6
Sub-Total		394				20.37 (18.48)	168.[illegible] (152.6)
4	Semi	2	500 (311)	0.24 (0.35)	956	0.24 (0.22)	2.3 (2.1)
	Tank truck	3	500 (311)	0.23 (0.34)	956	0.35 (0.32)	3.3 (3.0)
	Water truck	216	160 (99)	0.23 (0.34)	956	[illegible] (6.81)	76.[illegible] (68.9)
	Carry-all	5	20 (12)	0.03 (0.04)	956	0.00 (0.00)	[illegible]
	Off-road truck	67	8	12.80 (11.60)	956	6.86 (6.22)	65.6 (59.5)
	641-B scraper	8	8	20.30 (18.41)	956	1.30 (1.18)	12.4 (11.2)
	D-5 dozer	13	8	8.25 (7.48)	956	0.86 (0.78)	8.2 (7.4)
	12-G grader	37	8	8.60 (7.80)	956	2.55 (2.31)	24.3 (22.0)
	Backhoe	4	8	2.50 (2.27)	956	0.08 (0.07)	0.8 (0.7)
	Spreader	1	8	2.50 (2.27)	956	0.02 (0.02)	0.2 (0.2)
	Compactor	57	8	2.50 (2.27)	956	1.14 (1.03)	10.[illegible] [illegible]
	Pipelayer	4	8	6.95 (6.30)	956	0.22 (0.20)	2.1 (1.9)
Sub-Total		417				21.57 (19.56)	206.[illegible] (186.9)
Total		1,607				81.49 (73.91)	790.7 (717.2)

*All vehicles are diesel powered except carry-alls.

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Table 4.1.2.2-5. TSP emissions associated with shelter construction

1 SEGMENT NUMBER	2 VEHICLE TYPE[1]	3 NUMBER OF VEHICLES	4 DISTANCE TRAVELED mi/day (km/day) OR OPERATING TIME hr/day	5 EMISSION FACTOR x 10^{-5} tons/mi (tonnes/km) OR tons/hr (tonnes/hr)	6 NUMBER OF CONSTRUCTION DAYS	7 EMISSIONS PER DAY x 10^{-2} tons (tonnes) (3.) x (4.) x (5.)	8 TOTAL EMISSIONS tons (tonnes) (3.)x(4.)x(5.)x(6.)
1	32-ton truck	3	500 (311)	0.24 (0.35)	1239	0.36 (0.33)	4.5 (4.1)
	Concrete truck	50	150 (93)	0.18 (0.26)	1239	1.35 (1.22)	16.7 (15.1)
	Semi	2	500 (311)	0.24 (0.35)	1239	0.24 (0.22)	3.0 (2.7)
	Water truck	224	160 (99)	0.23 (0.34)	1239	8.24 (7.47)	102.1 (92.6)
	Carry-all	3	20 (12)	0.03 (0.04)	1239	0.00 (0.00)	0.0 (0.0)
	Flatbed truck	12	20 (12)	0.23 (0.34)	1239	0.06 (0.05)	0.7 (0.6)
	D-5 dozer	10	8	8.25 (7.48)	1239	0.66 (0.60)	8.2 (7.4)
	Compactor	3	8	2.50 (2.27)	1239	0.06 (0.05)	0.7 (0.6)
	D-9 with ripper	4	8	3.05 (2.77)	1239	0.06 (0.09)	1.2 (1.1)
	641-B scraper	6	8	20.30 (18.41)	1239	0.97 (0.88)	12.1 (11.0)
	12-G grader	2	8	3.05 (2.77)	1239	0.05 (0.05)	0.6 (0.5)
Sub-Total		319				12.09 (10.97)	149.8 (135.9)
2	32-ton truck	3	500 (311)	0.24 (0.35)	1173	0.36 (0.33)	4.2 (3.8)
	Concrete truck	39	150 (93)	0.18 (0.26)	1173	1.05 (0.95)	12.4 (11.2)
	Semi	1	500 (311)	0.24 (0.35)	1173	0.12 (0.11)	1.4 (1.3)
	Water truck	171	160 (99)	0.23 (0.34)	1173	6.29 (5.71)	73.8 (66.9)
	Carry-all	2	20 (12)	0.03 (0.04)	1173	0.00 (0.00)	0.0 (0.0)
	Flatbed truck	10	20 (12)	0.23 (0.34)	1173	0.05 (0.05)	0.5 (0.5)
	D-5 dozer	7	8	8.25 (7.48)	1173	0.46 (0.42)	5.4 (4.9)
	Compactor	2	8	2.50 (2.27)	1173	0.04 (0.04)	0.5 (0.5)
	D-9 with ripper	4	8	3.05 (2.77)	1173	0.10 (0.09)	1.1 (1.0)
	641-B scraper	5	8	20.30 (18.41)	1173	0.81 (0.73)	9.5 (8.6)
	12-G grader	1	8	3.05 (2.77)	1173	0.02 (0.02)	0.3 (0.3)
Sub-Total		245				9.30 (8.44)	109.1 (99.0)
3	32-ton truck	3	500 (311)	0.24 (0.35)	1043	0.36 (0.33)	3.8 (3.4)
	Concrete truck	44	150 (93)	0.18 (0.26)	1043	1.19 (1.08)	12.4 (11.2)
	Semi	1	500 (311)	0.24 (0.35)	1043	0.12 (0.11)	1.3 (1.2)
	Water truck	196	160 (99)	0.23 (0.34)	1043	7.21 (6.54)	75.2 (68.2)
	Carry-all	2	20 (12)	0.03 (0.04)	1043	0.00 (0.00)	0.0 (0.0)
	Flatbed truck	11	20 (12)	0.23 (0.34)	1043	0.05 (0.05)	0.5 (0.5)
	D-5 dozer	8	8	8.25 (7.48)	1043	0.53 (0.48)	5.5 (5.0)
	Compactor	2	8	2.50 (2.27)	1043	0.04 (0.04)	0.4 (0.4)
	D-9 with ripper	4	8	3.05 (2.77)	1043	0.10 (0.09)	1.0 (0.9)
	641-B scraper	5	8	20.30 (18.41)	1043	0.81 (0.73)	8.5 (7.7)
	12-G grader	1	8	3.05 (2.77)	1043	0.02 (0.02)	0.3 (0.3)
Sub-Total		277				10.43 (9.46)	108.9 (98.8)
4	32-ton truck	3	500 (311)	0.24 (0.35)	1043	0.36 (0.33)	3.8 (3.4)
	Concrete truck	47	150 (93)	0.18 (0.26)	1043	1.27 (1.15)	13.2 (12.0)
	Semi	1	500 (311)	0.24 (0.35)	1043	0.12 (0.11)	1.3 (1.2)
	Water truck	208	160 (99)	0.23 (0.34)	1043	7.65 (6.94)	79.8 (72.4)
	Carry-all	3	20 (12)	0.03 (0.04)	1043	0.00 (0.00)	0.0 (0.0)
	Flatbed truck	11	20 (12)	0.23 (0.34)	1043	0.05 (0.05)	0.5 (0.5)
	D-5 dozer	9	8	8.25 (7.48)	1043	0.59 (0.54)	6.2 (5.6)
	Compactor	3	8	2.50 (2.27)	1043	0.06 (0.05)	0.6 (0.5)
	D-9 with ripper	4	8	3.05 (2.77)	1043	0.10 (0.09)	1.0 (0.9)
	641-B scraper	6	8	20.30 (18.41)	1043	0.97 (0.88)	10.2 (9.3)
	12-G grader	1	8	3.05 (2.77)	1043	0.02 (0.02)	0.3 (0.3)
Sub-Total		296				11.19 (10.15)	116.9 (106.0)
Total		1,137				43.01 (39.01)	484.7 (439.6)

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[1]All vehicles are diesel powered except carry-alls.

Table 4.1.2.2-6. NO_x emissions associated with DTN construction.

1 SEGMENT NUMBER	2 VEHICLE TYPE	3 NUMBER OF VEHICLES	4 DISTANCE TRAVELED mi/day (km/day) OR OPERATING TIME hr/day	5 EMISSION FACTOR x 10^{-5} tons/mi (tonnes/km) OR tons/hr (tonnes/hr)	6 NUMBER OF CONSTRUCTION DAYS	7 EMISSIONS PER DAY X10^{-2} tons (tonnes) (3.)X(4.)X(5.)	8 TOTAL EMISSIONS tons (tonnes) (3.)X(4.)X(5.)X(6.)
	Spray Truck	2	20 (12)	2.19 (3.20)	586	0.09 (0.08)	0.5 (0.5)
	Semi	1	500 (311)	2.19 (3.20)	586	1.11 (1.01)	6.4 (5.8
	Tank Truck	3	500 (311)	2.19 (3.20)	586	3.29 (2.98)	19.3 (17.5)
	Water Truck	17[illegible]	160 (99)	2.19 (3.20)	586	59.57 (54.03)	349.1 (316.6)
	Carry All	[illegible]	20 (12)	0.25 (0.37)	586	0.02 (0.02	0.1 (0.1
	30-Ton Truck	32	240 (149)	2.19 (3.20)	586	16.82 (15.26)	98.6 (89.4)
	Off Road	39	8	381.5 (346.0)	586	119.03 (107.96)	697.5 (63[illegible].6)
	Truck			252.5(229.0)	586	34.34 (31.15)	201.2 (182.5)
1	D-5 Dozer	17	8	52.5 (47.6)	586	18.48 (16.76)	108.3 (98.2
	12-G Grader	44	8	120.0(108.8)	586	2.88 (2.61)	16.9 (15.3)
	Backhoe	3	8	311.0(282.1)	586	57.22 (51.90)	335.3 (304.1)
	641-B Scraper	23	8	52.0 (47.2)	586	20.80 (18.87)	121.9 (110.6
	Compactor	50	8	113.5(102.9)	586	2.72 (2.47)	16.0 (14.5
	Pipelayer	3	8	52.0 (47.2)	586	1.66 (1.51)	9.8 (6.9)
	Paver	4	8	52.0 (47.2)	586	3.33 (3.02)	19.5 (17.7)
	Roller	8	8				
Sub Total		402				341.36 (309.61)	2,0[illegible]0.4 (1,184.4)
	Spray Truck	2	20 (12)	2.19 (3.20)	564	0.09 (0.08)	0.5 (0.5
	Semi	1	500 (311)	2.19 (3.20)	564	1.10 (1.00)	6.2 (5.6
	Tank Truck	3	500 (311)	2.19 (3.20)	564	3.29 (2.98)	18.5 16.8)
	Water Truck	13[illegible]	160 (99)	2.19 (3.20)	564	45.55 (41.31)	256.9 (233.[illegible]
	Carry All	[illegible]	20 (12)	0.25 (0.37)	564	0.02 0.02)	0.1 (0.1)
	30-ton Truck	24	240 (149)	2.19 (3.20)	564	12.61 (11.44)	71.1 64.5)
	Off Road Truck	31	8	381.5 (346.0)	564	94.61 (85.81)	533.6 (484.0)
2	D-5 Dozer	13	8	252.5(229.0)	564	26.26 (23.82)	148.1 (134.3)
	12-G Grader	34	8	52.5 (47.6)	564	14.28 (12.95)	80.5 73.0)
	Backhoe	2	8	120.0(108.8)	564	1.92 (1.74)	10.8 (9.8)
	641-B Scraper	18	8	311.0(282.1)	564	44.78 (40.62)	252.6 (229.1)
	Compactor	38	8	52.0 (47.2)	564	15.81 (14.34)	89.2 (80.9)
	Pipelayer	2	8	113.5(102.9)	564	1.82 (1.65)	10.2 (9.3)
	Paver	3	8	52.0 (47.2)	564	1.25 (1.13)	7.0 (6.3.
	Roller	6	8	52.0 (47.2)	564	2.50 (2.27)	14.1 (12.8)
Sub Total		310				265.89 (241.16)	1,499.4 (1,360.0)
	Spray Truck	2	20 (12)	2.19 (3.20)	586	0.09 (0.08)	0.5 (0.5
	Semi	1	500 (311)	2.19 (3.20)	586	1.10 (1.00)	6.4 (5.8)
	Tank Truck	3	500 (311)	2.19 (3.20)	586	3.29 (2.98)	19.3 (17.5)
	Water Truck	149	160 (99)	2.19 (3.20)	586	52.21 (47.35)	305.9 (277.5)
	Carry All	3	20 (12)	0.25 (0.37)	586	0.02 (0.02)	0.1 (0.1)
	30-ton Truck	27	240 (149)	2.19 (3.20)	586	14.19 (12.87)	83.2 (75.5
	Off Road Truck	34	8	381.5 (346.0)	586	103.7[illegible] (94.12)	608.1 (551.5)
3	D-5 Dozer	15	8	252.5(229.0)	586	30.30 (27.48)	177.6 161.1
	12-G Grader	39	8	52.5 (47.6)	586	16.38 (14.86)	96.0 87.1)
	Backhoe	2	8	120.0(108.8)	586	1.92 (1.74)	11.3 (10.2)
	641-B Scraper	20	8	311.0(282.1)	586	49.76 (45.13)	291.6 (264.5)
	Compactor	44	8	52.0 (47.2)	586	18.30 (16.60)	107.3 (97.3)
	Pipelayer	2	8	113.5(102.9)	586	1.82 (1.65)	10.6 (9.6)
	Paver	3	8	52.0 (47.2)	586	1.25 (1.13)	7.3 6.6)
	Roller	7	8	52.0 (47.2)	586	2.91 (2.64)	17.1 (15.5)
Sub Total		351				297.31 (269.66)	1,742.3 (1,580.[illegible])
	Spray Truck	2	20 (12)	2.19 (3.20)	500	0.09 (0.08)	0.4 (0.4)
	Semi	1	500 (311)	2.19 (3.20)	500	1.10 (1.00)	5.5 (5.0)
	Tank Truck	3	500 (311)	2.19 (3.20)	500	3.29 (2.98)	16.4 (14.9)
	Water Truck	158	160 (99)	2.19 (3.20)	500	55.36 (50.21)	276.8 (251.1
	Carry All	3	20 (12)	0.25 (0.37)	500	0.02 (0.02)	0.1 (0.1)
	30-ton Truck	29	240 (149)	2.19 (3.20)	500	15.24 (13.82)	76.2 (69.1)
	Off Road Truck	36	8	381.5 (346.0)	500	109.87 (99.65)	549.4 (498.3)
4	D-5 Dozer	16	8	252.5(229.0)	500	32.32 (29.31)	161.6 (146.6)
	12-G Grader	41	8	52.5 (47.6)	500	17.22 (15.62)	86.1 (78.1)
	Backhoe	3	8	120.0(108.8)	500	2.88 (2.61)	14.4 (13.1)
	641-B Scraper	21	8	311.0(282.1)	500	52.25 (47.39)	261.2 (236.9)
	Compactor	46	8	52.0 (47.2)	500	19.14 (17.36)	96.7 (86.9)
	Pipelayer	3	8	113.5(102.9)	500	2.72 (2.47)	13.6 (12.3)
	Paver	4	8	52.0 (47.2)	500	1.66 (1.51)	8.3 (7.5)
	Roller	7	8	52.0 (47.2)	500	2.91 (2.64)	14.6 (13.2)
Sub Total		373				316.37 (286.68)	1,580.3 (1,433.[illegible])
TOTAL		1,436				1,220.63 (1,1[illegible].11)	6,822.4 (6,[illegible].9)

All vehicles are diesel powered except carry-alls.

Table 4.1.2.2-7. NO_x emissions associated with cluster road construction.

1 SEGMENT NUMBER	2 VEHICLE TYPE[1]	3 NUMBER OF VEHICLES	4 DISTANCE TRAVELED mi/day (km/day) OR OPERATING TIME hr/day	5 EMISSION FACTOR x 10^{-5} tons/mi (tonnes/km) OR tons/hr (tonnes/hr)	6 NUMBER OF CONSTRUCTION DAYS	7 EMISSIONS PER DAY X 10^{-2} ton (tonnes) (3.) x (4.) x (5.)	8 TOTAL EMISSIONS tons (tonnes) (3.) x (4.) x (5.) x (6.)
1	Semi	2	500 (311)	2.19 (3.20)	1151	2.19 (1.99)	25.2 (22.9)
	Tank truck	3	500 (311)	2.19 (3.20)	1151	3.29 (2.98)	37.8 (34.3)
	Water truck	233	160 (99)	2.19 (3.20)	1151	81.64 (74.05)	939.7 (852.3)
	Carry all	6	20 (12)	0.25 (0.37)	1151	0.03 (0.03)	0.3 (0.3)
	Off road truck	73	8	381.5 (346.0)	1151	222.80 (202.08)	2,564.4 (2,325.9)
	641-B scraper	8	8	311.0 (282.1)	1151	19.90 (18.05)	229.1 (207.8)
	D-5 dozer	13	8	252.5 (229.0)	1151	26.26 (23.82)	302.1 (274.2)
	12-G grader	40	8	52.5 (47.6)	1151	16.80 (15.24)	193.4 (175.4)
	Backhoe	5	8	120.0 (108.8)	1151	4.80 (4.35)	55.2 (50.1)
	Spreader	1	8	52.0 (47.2)	1151	.42 (0.38)	4.8 (4.4)
	Compactor	61	8	52.0 (47.2)	1151	25.38 (23.02)	292.1 (264.9)
	Pipelayer	5	8	113.5 (102.9)	1151	4.54 (4.12)	52.3 (47.4)
Sub-Total		450				408.05 (370.10)	4,696.6 (4,259.8)
2	Semi	1	500 (311)	2.19 (3.20)	934	1.10 (1.00)	10.2 (9.3)
	Tank truck	3	500 (311)	2.19 (3.20)	934	3.29 (2.98)	30.7 (27.8)
	Water truck	179	160 (99)	2.19 (3.20)	934	62.72 (56.89)	585.8 (531.3)
	Carry all	4	20 (12)	0.25 (0.37)	934	0.02 (0.02)	0.2 (0.2)
	Off road truck	56	8	381.5 (346.0)	934	170.91 (155.02)	1,596.3 (1,447.8)
	641-B scraper	7	8	311.0 (282.1)	934	17.42 (15.80)	162.7 (147.6)
	D-5 dozer	10	8	252.5 (229.0)	934	20.20 (18.32)	188.7 (171.2)
	12-G grader	30	8	52.5 (47.6)	934	12.60 (11.43)	117.7 (106.8)
	Backhoe	4	8	120.0 (108.8	934	38.40 (34.83)	35.9 (32.6)
	Spreader	1	8	52.0 (47.2)	934	0.43 (0.38)	3.9 (3.5)
	Compactor	47	8	52.0 (47.2)	934	19.55 (17.73)	182.6 (165.6)
	Pipelayer	4	8	113.5 (102.9)	934	3.63 (3.29)	33.9 (30.7)
Sub-Total		346				350.26 (317.69)	2,948.6 (2,674.4)
3	Semi	2	500 (311)	2.19 (3.20)	826	2.19 (1.99)	18.1 (16.4)
	Tank truck	3	500 (311)	2.19 (3.20)	826	3.29 (2.98)	27.1 (24.6)
	Water truck	204	160 (99)	2.19 (3.20)	826	71.48 (64.83)	590.4 (535.5)
	Carry all	5	20 (12)	0.25 (0.37)	826	0.03 (0.03)	0.2 (0.2)
	Off road truck	64	8	381.5 (346.0)	826	195.33 (177.16)	1,613.4 (1,463.4)
	641-B scraper	7	8	311.0 (282.1)	826	17.42 (15.80)	143.9 (130.5)
	D-5 dozer	12	8	252.5 (229.0)	826	24.24 (21.99)	200.2 (181.6)
	12-G grader	35	8	52.5 (47.6)	826	14.70 (13.33)	121.4 (110.1)
	Backhoe	4	8	120.0 (108.8)	826	3.84 (3.48)	31.7 (28.8)
	Spreader	1	8	52.0 (47.2)	826	0.42 (0.38)	3.4 (3.1)
	Compactor	53	8	52.0 (47.2)	826	22.05 (20.00)	182.1 (165.2)
	Pipelayer	4	8	113.5 (102.9)	826	3.63 (3.29)	30.0 (27.2)
Sub-Total		394				368.62 (325.27)	2,961.9 (2,686.4)
4	Semi	2	500 (311)	2.19 (3.20)	956	2.19 (1.99)	20.9 (19.0)
	Tank truck	3	500 (311)	2.19 (3.20)	956	3.29 (2.98)	31.4 (28.5)
	Water truck	216	160 (99)	2.19 (3.20)	956	75.69 (68.65)	723.6 (656.3)
	Carry all	5	20 (12)	0.25 (0.37)	956	0.03 (0.03)	0.2 (0.2)
	Off road truck	67	8	381.5 (346.0)	956	204.48 (185.46)	1,954.9 (1,773.1)
	641-B scraper	8	8	311.0 (282.1)	956	19.90 (18.05)	190.3 (172.6)
	D-5 dozer	13	8	252.5 (229.0)	956	26.26 (23.82)	251.0 (227.7)
	12-G grader	37	8	52.5 (47.6)	956	15.54 (14.09)	148.6 (134.8)
	Backhoe	4	8	120.0 (108.8)	956	3.84 (3.48)	36.7 (33.3)
	Spreader	1	8	52.0 (47.2)	956	0.42 (0.38)	4.0 (3.6)
	Compactor	57	8	52.0 (47.2)	956	23.71 (21.50)	226.7 (205.6)
	Pipelayer	4	8	113.5 (102.9)	956	3.63 (3.29)	34.7 (31.5)
Sub-Total		417				378.98 (343.73)	3,623.0 (3,286.1)
Total		1,607				1,495.91 (1,356.79)	14,230.1 (12,906.7)

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[1]All vehicles are diesel powered except carry-alls.

Table 4.1.2.2-8. NO_x emissions associated with shelter construction.

1 SEGMENT NUMBER	2 VEHICLE TYPE[a]	3 NUMBER OF VEHICLES	4 DIST. TRAVELED mi/day (km/day) OR OPERATING TIME hr/day	5 FACTOR x 10^{-5} tons/mi (tonnes/km) OR tons/hr (tonnes/hr)	6 NUMBER OF CONSTRUCTION DAYS	7 EMISSIONS PER PAY x 10^4 tons (tonnes) (3.) x (4.) x (5.)	8 TOTAL EMISSIONS tons (tonnes) (3.) x (4.) x (5.) x (6.)
1	32-ton Truck	3	500 (311)	2.19 (3.20)	1,239	3.29 (2.98)	40.7 (36.9)
	Concrete Truck	50	150 (93)	2.19 (3.20)	1,239	16.43 (14.90)	203.5 (184.5)
	Semi	2	500 (311)	2.19 (311)	1,239	2.19 (1.99)	27.1 (24.6)
	Water Truck	224	160 (99)	2.19 (3.20)	1,239	78.49 (71.19)	972.5 (882.1)
	Carry All	3	20 (12)	0.25 (0.37)	1,239	0.02 (0.02)	0.2 (0.2)
	Flatbed Truck	12	20 (12)	2.19 (3.20)	1,239	0.53 (0.48)	6.5 (5.9)
	D-5 Dozer	10	8	252.5 (229.0)	1,239	20.20 (18.32)	250.3 (227.0)
	Compactor	3	8	52.0 (47.2)	1,239	1.25 (1.13)	15.5 (14.0)
	D-9 w/Ripper	4	8	52.5 (47.6)	1,239	1.68 (1.52)	20.8 (18.9)
	641-B Scraper	6	8	311.0 (282.1)	1,239	14.93 (13.54)	185.0 (167.8)
	12-G Grader	2	8	52.5 (47.6	1,239	0.84 (0.76)	10.4 (9.4)
Subtotal		319				139.85 (126.84)	1,732.5 (1,571.4)
2	32-ton Truck	3	500 (311)	2.19 (3.20)	1,173	3.29 (2.98)	38.5 (34.9)
	Concrete Truck	39	150 (93)	2.19 (3.20)	1,173	12.81 (11.62)	150.3 (136.3)
	Semi	1	500 (311)	2.19 (3.20)	1,173	1.10 (1.00)	12.8 (11.6)
	Water Truck	171	160 (99)	2.19 (3.20)	1,173	59.92 (54.35)	702.8 (638.4)
	Carry All	2	20 (12)	0.25 (0.37)	1,173	0.01 (0.01)	0.1 (0.1)
	Flatbed Truck	10	20 (12)	2.19 (3.20)	1,173	0.44 (0.40)	5.1 (4.6)
	D-5 Dozer	7	8	252.5 (229.0)	1,173	14.14 (12.82)	165.9 (150.5)
	Compactor	2	8	52.0 (47.2)	1,173	0.83 (0.75)	9.8 (8.9)
	D-9 w/Ripper	4	8	52.5 (47.6)	1,173	1.68 (1.52)	19.7 (17.9)
	641-B Scraper	5	8	311.0 (282.1)	1,173	12.44 (11.28)	145.9 (132.3)
	12-G Grader	1	8	52.5 (47.6)	1,173	0.42 (0.38)	4.9 (4.4)
Subtotal		245				107.08 (97.12)	1,255.8 (1,139.0)
3	32-Ton Truck	3	500 (311)	2.19 (3.20)	1,043	3.29 (2.98)	34.3 (31.1)
	Concrete Truck	44	150 (93)	2.19 (3.20)	1,043	14.45 (13.11)	150.8 (136.8)
	Semi	1	500 (311)	2.19 (3.20)	1,043	1.10 (1.00)	11.4 (10.3)
	Water Truck	196	160 (99)	2.19 (3.20)	1,043	68.68 (62.29)	716.3 (649.7)
	Carry All	2	20 (12)	0.25 (0.37)	1,043	0.00 (0.00)	[illegible]
	Flatbed Truck	11	20 (12)	2.19 (3.20)	1,043	0.48 (0.44)	5.0 (4.5)
	D-5 Dozer	8	8	252.5 (229.0)	1,043	16.16 (14.66)	168.5 (152.8)
	Compactor	2	8	52.0 (47.2)	1,043	0.83 (0.75)	[illegible]
	D-9 w/Ripper	4	8	52.5 (47.6)	1,043	1.68 (1.52)	[illegible]
	641-B Scraper	5	8	311.0 (182.1)	1,043	12.44 (11.28)	[illegible]
	12-G Grader	1	8	52.5 (47.6)	1,043	0.42 (0.38)	4.4 (4.0)
Subtotal		277				119.53 (108.41)	[illegible]
4	32-Ton Truck	3	500 (311)	2.19 (3.20)	1,043	3.29 (2.98)	[illegible]
	Concrete Truck	47	150 (93)	2.19 (3.20)	1,043	15.44 (14.00)	[illegible]
	Semi	1	500 (311)	2.19 (3.20)	1,043	1.10 (1.00)	11.4 (10.3)
	Water Truck	208	160 (99)	2.19 (3.20)	1,043	72.88 (66.10)	760.2 (689.5)
	Carry All	3	20 (12)	0.25 (0.37)	1,043	0.02 (0.02)	[illegible]
	Flatbed Truck	11	20 (12)	2.19 (3.20)	1,043	0.48 (0.44)	[illegible]
	D-5 Dozer	9	8	252.5 (229.0)	1,043	18.18 (16.49)	[illegible]
	Compactor	3	8	52.0 (47.2)	1,043	1.25 (1.13)	[illegible]
	D-9 w/Ripper	4	8	52.5 (47.6)	1,043	1.68 (1.52)	[illegible]
	641-B Scraper	6	8	311.0 (282.1)	1,043	14.93 (13.54)	[illegible]
	12-G Grader	1	8	52.5 (47.6)	1,043	0.42 (0.38)	4.4 (4.0)
Subtotal		296				129.67 (117.61)	1,352.3 (1,226.5)
Total		1,137				496.13 (449.99)	5,587.2 (5,067.6)

[a] All vehicles are diesel powered except carry-alls.

Table 4.1.2.2-9. CO emissions associated with shelter construction.

1 SEGMENT NUMBER	2 VEHICLE TYPE[1]	3 NUMBER OF VEHICLES	4 DISTANCE TRAVELED mi/day (km/day) OR OPERATING TIME hr/day	5 EMISSION FACTOR $\times 10^{-5}$ tons/mi (tonnes/km) OR tons/hr (tonnes/hr)	6 NUMBER OF CONSTRUCTION DAYS	7 EMISSIONS PER DAY $\times 10^{-2}$ tons (tonnes) (3.) x (4.) x (5.)	8 TOTAL EMISSIONS tons (tonnes) (3.) x (4.) x (5.) x (6.)
1	32-Ton Truck	3	500 (311)	2.98 (4.35)	1,239	4.47 (4.05)	55.4 (50.2)
	Concrete Truck	50	150 (93)	2.98 (4.35	1,239	22.35 (20.27	276.9 (251.2)
	Semi	2	500 (311)	2.98 (4.35)	1,239	2.98 (2.70)	36.9 (33.5)
	Water Truck	224	160 (99)	2.98 (4.35)	1,239	106.80 (96.87)	1,323.3 (1,200.2)
	Carry All	3	20 (12)	4.47 (6.53)	1,239	0.27 (0.24)	3.3 (3.0)
	Flatbed Truck	12	20 (12)	2.98 (4.35)	1,239	0.72 (0.65)	8.9 (8.1)
	D-5 Dozer	10	8	36.95 (33.51	1,239	2.96 (2.68)	36.6 (33.2)
	Compactor	3	8	9.20 (8.34)	1,239	0.22 (0.20)	2.7 (2.4)
	D-9 w/Ripper	4	8	10.75 (9.75)	1,239	0.34 (0.31)	4.3 (3.9)
	641-B Scraper	6	8	73.00 (66.21)	1,239	3.50 (3.17)	43.4 (39.4)
	12-G Grader	2	8	10.75 (9.75)	1,239	0.17 (0.15)	2.1 (1.9)
Sub-total		319				144.78 (131.32)	1,793.8 (1,627.0)
2	32-Ton Truck	3	500 (311)	2.98 (4.35)	1,173	4.47 (4.05)	52.4 (47.5)
	Concrete Truck	39	150 (93)	2.98 (4.35)	1,173	17.43 (15.81)	204.5 (185.5)
	Semi	1	500 (311)	2.98 (4.35)	1,173	1.49 (1.35)	17.5 (15.9)
	Water Truck	171	160 (99)	2.98 (4.35)	1,173	81.53 (73.95)	956.4 (867.5)
	Carry All	2	20 (12)	4.47 (6.53)	1,173	0.18 (0.16)	2.1 (1.9)
	Flatbed Truck	10	20 (12)	2.98 (4.35)	1,173	0.60 (0.54)	7.0 (6.3,
	D-5 Dozer	7	8	36.95 (33.51)	1,173	2.07 (1.88)	24.3 (22.0)
	Compactor	2	8	9.20 (8.34)	1,173	0.15 (0.14)	1.7 (1.5)
	D-9 w/Ripper	4	8	10.75 (9.75)	1,173	0.34 (0 31)	4.0 (3.6)
	641-B Scraper	5	8	73.00 (66.21)	1,173	2.92 (2.65)	34.3 (31.1)
	12-G Grader	1	8	10.75 (9.75)	1,173	0.09 (0.08)	1.0 (0.9)
Sub-total		245				111.27 (100.92)	1,305.2 (1,183.8)
3	32-Ton Truck	3	500 (311)	2.98 (4.35)	1,043	4.47 (4.05)	46.6 (42.3)
	Concrete Truck	44	150 (93)	2.98 (4.35)	1,043	19.67 (17.84)	205.1 (186.0)
	Semi	1	500 (311)	2.98 (4.35)	1,043	1.49 (1.35)	15.5 (14.1)
	Water Truck	146	160 (99)	2.98 (4.35)	1,043	93.45 (84.76)	974.7 (884.1)
	Carry All	2	20 (12)	4.47 (6.53)	1,043	0.18 (0.16)	1.9 (1.7)
	Flatbed Truck	11	20 (12)	2.98 (4.35)	1,043	0.66 (0.60)	6.8 (6.2)
	D-5 Dozer	8	8	36.95 (33.51)	1,043	2.36 (2.14)	24.7 (22.4)
	Compactor	2	8	9.20 (8.34)	1,043	0.15 (0.14)	1.5 (1.4)
	D-9 w/Ripper	4	8	10.75 (9.75)	1,043	3.54 (3.21)	37.0 (33.6)
	641-B Scraper	5	8	73.00 (66.21)	1,043	2.92 (2.65)	30.5 (27.7)
	12-G Grader	1	8	10.75 (9.75)	1,043	0.09 (0.08)	0.9 (0.8)
Sub-total		277				128.98 (116.98)	1,345.2 (1,220.1)
4	32-Ton Truck	3	500 (311)	2.98 (4.35)	1,043	4.47 (4.05)	46.6 (42.3)
	Concrete Truck	47	150 (93)	2.98 (4.35)	1,043	21.01 (19.06)	219.1 (198.7)
	Semi	1	500 (311)	2.98 (4.35)	1,043	1.49 (1.35)	15.5 (14.1)
	Water Truck	208	160 (99)	2.98 (4.35)	1,043	99.17 (89.95)	1,034.4 (938.2)
	Carry All	3	20 (12)	4.47 (6.53)	1,043	0.27 (0.24)	2.8 (2.5)
	Flatbed Truck	11	20 (12)	2.98 (4.35)	1,043	6.62 (6.00)	69.0 (62.6)
	D-5 Dozer	9	8	36.95 (33.51)	1,043	2.66 (2.41)	27.7 (25.1)
	Compactor	3	8	9.20 (8.34)	1,043	0.22 (0.20)	2.3 (2.1)
	D-9 w/Ripper	4	8	10.75 (9.75)	1,043	0.34 (0.31)	3.6 (3.3)
	641-B Scraper	6	8	73.00 (66.21)	1,043	3.50 (3.17)	36.5 (33.1)
	12-G Grader	1	8	10.75 (9.75)	1,043	0.09 (0.08)	0.9 (0.8)
Sub-total		296				139.84 (126.83)	1,458.4 (1,322.8)
Total		1,137				524.87 (476.06)	5,902.6 (5,353.7)

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[1] All vehicles are diesel powered except carry alls.

Table 4.1.2.2-10. CO emissions associated with cluster road construction.

1 SEGMENT NUMBER	2 VEHICLE TYPE[1]	3 NUMBER OF VEHICLES	4 DISTANCE TRAVELED mi/day (km/day) OR OPERATING TIME hr/day	5 EMISSION FACTOR $\times 10^{-5}$ tons/mi (tonnes/mi) OR tons/hr (tonnes/hr)	6 NUMBER OF CONSTRUCTION DAYS	7 EMISSIONS PER DAY $\times 10^{-2}$ tons (tonnes) (3.) x (4.) x (5.)	8 TOTAL EMISSIONS tons (tonnes) (3.) x (4.) x (5.) x (6.)
1	Semi	2	500 (311)	2.98 (4.35)	1151	2.98 (2.70)	34.3 (31.1)
	Tank truck	3	500 (311)	2.98 (4.35)	1151	4.47 (4.05)	51.4 (46.6)
	Water truck	233	160 (99)	2.98 (4.35)	1151	111.09 (100.76)	1,278.7 (1,159.8)
	Carry all	6	20 (12)	4.47 (6.53)	1151	0.54 (0.49)	6.2 (5.6)
	Off road truck	73	8	67.00 (60.77)	1151	39.13 (35.49)	450.4 (408.5)
	641-B scraper	8	8	73.00 (66.21)	1151	4.67 (4.24)	53.8 (48.8)
	D-5 dozer	13	8	36.95 (33.51)	1151	3.84 (3.48)	44.2 (40.1)
	12-G grader	40	8	10.75 (9.75)	1151	3.44 (3.12)	39.6 (35.9)
	Backhoe	5	8	27.65 (25.08)	1151	1.11 (1.01)	12.7 (11.5)
	Spreader	1	8	9.20 (8.34)	1151	0.07 (0.06)	8.2 (7.4)
	Compactor	61	8	9.20 (8.34)	1151	4.49 (4.07)	51.7 (46.9)
	Pipelayer	5	8	20.70 (18.77)	1151	0.83 (0.75)	9.5 (8.6)
Sub-Total		450				176.66 (160.23)	2,040.7 (1,850.9)
2	Semi	1	500 (311)	2.98 (4.35)	934	1.49 (1.35)	13.9 (12.6)
	Tank truck	3	500 (311)	2.98 (4.35)	934	4.47 (4.05)	41.7 (37.8)
	Water truck	179	160 (99)	2.92 (4.35)	934	83.63 (75.85)	781.1 (708.5)
	Carry all	4	20 (12)	4.47 (6.53)	934	0.36 (0.33)	3.3 (3.0)
	Off road truck	56	8	67.00 (60.77)	934	30.02 (27.23)	280.3 (254.2)
	641-B Scraper	7	8	73.00 (66.21)	934	4.09 (3.71)	38.2 (34.6)
	D-5 dozer	10	8	36.95 (33.51)	934	2.96 (2.68)	27.6 (25.0)
	12-G grader	30	8	10.75 (9.75)	934	2.58 (2.34)	24.1 (21.9)
	Backhoe	4	8	27.65 (25.08)	934	0.88 (0.80)	8.3 (7.5)
	Spreader	1	8	9.20 (8.34)	934	0.07 (0.06)	0.7 (0.6)
	Compactor	47	8	9.20 (8.34)	934	3.46 (3.14)	32.3 (29.3)
	Pipelayer	4	8	20.70 (18.77)	934	0.66 (0.60)	6.2 (5.6)
Sub-Total		346				134.67 (122.15)	1,257.7 (1,140.7)
3	Semi	2	500 (311)	2.98 (4.35)	826	2.98 (2.70)	24.6 (22.3)
	Tank truck	3	500 (311)	2.98 (4.35)	826	4.47 (4.05)	36.9 (33.5)
	Water truck	204	160 (99)	2.98 (4.35)	826	97.27 (88.22)	803.4 (728.7)
	Carry all	5	20 (12)	4.47 (6.53)	826	0.45 (0.41)	3.7 (3.4)
	Off road truck	64	8	67.00 (60.77)	826	34.30 (31.11)	283.4 (257.0)
	641-B scraper	7	8	73.00 (66.21)	826	4.09 (3.71)	337.9 (306.5)
	D-5 dozer	12	8	36.95 (33.51)	826	3.55 (3.22)	29.3 (26.6)
	12-G grader	35	8	10.75 (9.75)	826	3.01 (2.73)	24.9 (22.6)
	Backhoe	4	8	27.65 (25.08)	826	0.88 (0.80)	7.3 (6.6)
	Spreader	1	8	9.20 (8.34)	826	0.07 (0.06)	0.6 (0.5)
	Compactor	53	8	9.20 (8.34)	826	3.90 (3.54)	32.2 (29.2)
	Pipelayer	4	8	20.70 (18.77)	826	0.66 (0.60)	5.5 (5.0)
Sub-Total		394				155.63 (141.16)	1,589.7 (1,441.9)
4	Semi	2	500 (311)	2.98 (4.35)	956	2.99 (2.70)	28.5 (25.8)
	Tank truck	3	500 (311)	2.98 (4.35)	956	4.47 (4.05)	42.7 (38.7)
	Water truck	216	160 (99)	2.98 (4.35)	956	102.99 (93.41)	984.6 (893.0)
	Carry all	5	20 (12)	4.47 (6.53)	956	0.45 (0.41)	4.3 (3.9)
	Off road truck	67	8	67.00 (60.77)	956	35.91 (32.57)	343.3 (311.4)
	641-B scraper	8	8	73.00 (66.21)	956	4.67 (4.24)	44.7 (40.5)
	D-5 dozer	13	8	36.95 (33.51)	956	3.84 (3.48)	36.7 (33.3)
	12-G grader	37	8	10.75 (9.75)	956	3.18 (2.88)	30.4 (27.6)
	Backhoe	4	8	27.65 (25.08)	956	8.88 (8.05)	84.9 (77.0)
	Spreader	1	8	9.20 (8.34)	956	0.07 (0.06)	0.7 (0.6)
	Compactor	57	8	9.20 (8.34)	956	4.20 (3.81)	40.1 (36.4)
	Pipelayer	4	8	20.70 (18.77)	956	0.66 (0.60)	6.3 (5.7)
Sub-Total		417				173.30 (157.18)	1,647.2 (1,494.0)
Total		1,607				640.26 (580.72)	6,535.3 (5,927.5)

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[1]All vehicles are diesel powered except carry-alls.

Table 4.1.2.2-11. CO emissions associated with shelter construction.

1 SEGMENT NUMBER	2 VEHICLE TYPE[1]	3 NUMBER OF VEHICLES	4 DISTANCE TRAVELED mi/day (km/day) OR OPERATING TIME hr/day	5 EMISSION FACTOR X 10^{-5} tons/mi (tonnes/km) OR tons/hr (tonnes/hr)	6 NUMBER OF CONSTRUCTION DAYS	7 EMISSIONS PER DAY X 10^{-2} tons (tonnes) (3.) x (4.) x (5.)	8 TOTAL EMISSIONS tons (tonnes) (3.) x (4.) x (5.) x (6.)
1	Spray truck	2	20 (12)	2.98 (4.35)	586	0.12 (0.11)	0.7 (0.6)
	Semi	1	500 (311)	2.98 (4.35)	586	1.49 (1.35)	8.7 (7.9)
	Tank Truck	3	500 (311)	2.98 (4.35)	586	4.47 (4.05)	26.2 (23.8)
	Water truck	170	160 (99)	2.98 (4.35)	586	81.06 (73.52)	475.0 (430.8)
	Carry all	3	20 (12)	4.47 (6.53)	586	0.27 (0.24)	1.6 (1.4)
	30-ton truck	32	240 (149)	2.98 (4.35)	586	22.89 (20.76)	134.1 (121.6)
	Off road truck	39	8	67.00 (60.77)	586	20.90 (18.96)	122.5 (111.1)
	D-5 dozer	17	8	36.95 (33.51)	586	5.02 (4.55)	29.4 (26.7)
	12-G grader	44	8	10.75 (9.75)	586	3.78 (3.43)	22.1 (20.0)
	Backhoe	3	8	27.65 (25.08)	586	0.66 (0.60)	3.9 (3.5)
	641-B scraper	23	8	73.00 (66.21)	586	13.43 (12.18)	78.7 (71.4)
	Compactor	50	8	9.20 (8.34)	586	3.68 (3.34)	21.6 (19.6)
	Pipelayer	3	8	20.70 (18.77)	586	0.50 (0.45)	2.9 (2.6)
	Paver	4	8	9.20 (8.34)	586	0.29 (0.26)	1.7 (1.5)
	Roller	8	8	9.20 (8.34)	586	0.59 (0.53)	3.4 (3.1)
Sub-Total		403				159.15 (144.35)	932.5 (845.8)
2	Spray truck	2	20 (12)	2.98 (4.35)	564	0.12 (0.11)	0.7 (0.6)
	Semi	1	500 (311)	2.98 (4.35)	564	1.49 (1.35)	8.4 (7.6)
	Tank truck	3	500 (311)	2.98 (4.35)	564	4.47 (4.05)	25.2 (22.9)
	Water truck	130	160 (99)	2.98 (4.35)	564	61.98 (56.22)	349.6 (317.1)
	Carry all	3	20 (12)	4.47 (6.53)	564	2.67 (2.42)	15.0 (13.6)
	30-ton truck	24	240 (149)	2.98 (4.35)	564	17.16 (15.56)	96.8 (87.8)
	Off road truck	31	8	67.00 (60.77)	564	16.61 (15.06)	93.7 (85.0)
	D-5 dozer	13	8	36.95 (33.51)	564	3.84 (3.47)	21.7 (19.7)
	12-G grader	34	8	10.75 (9.75)	564	2.92 (2.65)	16.5 (15.0)
	Backhoe	2	8	27.65 (25.08)	564	0.44 (0.40)	2.5 (2.27)
	641-B scraper	18	8	73.00 (66.21)	564	10.51 (9.53)	59.3 (53.8)
	Compactor	38	8	9.20 (8.34)	564	2.79 (2.53)	15.8 (14.3)
	Pipelayer	2	8	20.70 (18.77)	564	0.33 (0.30)	1.9 (1.7)
	Paver	3	8	9.20 (8.34)	564	0.22 (0.20)	1.2 (1.1)
	Roller	6	8	9.20 (8.34)	564	0.44 (0.40)	2.5 (2.3)
Sub-Total		310				125.99 (114.27)	710.8 (644.7)
3	Spray truck	2	20 (12)	2.98 (4.35)	586	0.12 (o.11)	0.7 (0.6)
	Semi	1	500 (311)	2.98 (4.35)	586	1.49 (1.35)	8.7 (7.9)
	Tank truck	3	500 (311)	2.98 (4.35)	586	4.47 (4.05)	26.2 (23.8)
	Water truck	149	160 (99)	2.98 (4.35)	586	71.04 (64.43)	416.3 (377.6)
	Carry all	3	20 (12)	4.47 (6.53)	586	0.27 (0.24)	1.6 (1.5)
	30-ton truck	27	240 (149)	2.98 (4.35)	586	19.31 (17.51)	113.2 (102.7)
	Off road truck	34	8	67.00 (60.77)	586	18.22 (16.53)	106.8 (96.9)
	D-5 dozer	15	8	36.95 (33.51)	586	4.43 (4.02)	26.0 (23.6)
	12-G grader	39	8	10.75 (9.75)	586	3.35 (3.04)	19.6 (17.8)
	Backhoe	2	8	27.65 (25.08)	586	0.44 (0.40)	2.6 (2.4)
	641-B scraper	20	8	73.00 (66.21)	586	11.68 (10.59)	68.4 (62.0)
	Compactor	44	8	9.20 (8.34)	586	3.24 (2.94)	19.0 (17.2)
	Pipelayer	2	8	20.70 (18.77)	586	0.33 (0.30)	1.9 (1.7)
	Paver	3	8	9.20 (8.34)	586	0.22 (0.20)	1.3 (1.2)
	Roller	7	8	9.20 (8.34)	586	0.52 (0.47)	3.0 (2.7)
Sub-Total		351				139.13 (126.19)	815.3 (739.5)
4	Spray truck	2	20 (12)	2.98 (4.35)	500	0.12 (0.11)	0.6 (0.5)
	Semi	1	500 (311)	2.98 (4.35)	500	1.49 (1.35)	7.5 (6.8)
	Tank truck	3	500 (311)	2.98 (4.35)	500	4.47 (4.05)	22.4 (20.3)
	Water truck	158	160 (99)	2.98 (4.35)	500	75.33 (68.32)	376.7 (341.7)
	Carry all	3	20 (12)	4.47 (6.53)	500	0.27 (0.24)	1.3 (1.2)
	30-ton truck	29	240 (149)	2.98 (4.35)	500	20.74 (18.81)	103.7 (94.1)
	Off road truck	36	8	67.00 (60.77	500	19.30 (17.51)	96.5 (87.5)
	D-5 dozer	16	8	36.95 (33.51)	500	4.73 (4.29)	23.6 (21.4)
	12-G grader	41	8	10.75 (9.75)	500	3.53 (3.20)	17.6 (16.0)
	Backhoe	3	8	27.65 (25.08)	500	0.66 (0.60)	3.3 (3.0)
	641-B scraper	21	8	73.00 (66.21)	500	12.26 (11.12)	61.3 (55.6)
	Compactor	46	8	9.20 (8.34)	500	3.39 (3.07)	16.9 (15.3)
	Pipelayer	3	8	20.70 (18.77)	500	0.50 (0.45)	2.5 (2.3)
	Paver	4	8	9.20 (8.34)	500	0.29 (0.26)	1.5 (1.4)
	Roller	7	8	9.20 (8.34)	500	0.52 (0.47)	2.6 (2.4)
Sub-Total		373				147.60 (133.87)	738.0 (669.4)
Total		1,436				571.87 (518.69)	3,196.6 (2,899.3)

[1]All vehicles are diesel powered except carry-alls.

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Table 4.1.2.2-12. SO_x emissions associated with DTN construction.

1	2	3	4	5	6	7	8
SEGMENT NUMBER	VEHICLE TYPE[1]	NUMBER OF VEHICLES	DISTANCE TRAVELED mi/day (km/day) OR OPERATING TIME (hr/day)	EMISSION FACTOR x 10^{-5} tons/mi (tonnes/km) OR tons/hr (tonnes/hr)	NUMBER OF CONSTRUCTION DAYS	EMISSIONS PER DAY x 10^{-2} tons (tonnes) (3.) x (4.) x (5.)	TOTAL EMISSIONS tons (tonnes) (3.)x(4.)x(5.)x(6.)
1	Spray truck	2	20 (12)	0.31 (0.45)	586	0.01 (0.01)	0.1 (0.1)
	Semi	1	500 (311)	0.31 (0.45)	586	0.16 (0.15)	0.9 (0.8)
	Tank Truck	3	500 (311)	0.31 (0.45)	586	0.47 (0.43)	2.7 (2.4)
	Water truck	170	160 (99)	0.31 (0.45)	586	8.43 (7.65)	49.4 (44.8)
	Carry All	3	20 (12)	—[2]	586	—[2]	—[2]
	30-Ton truck	32	240 (149)	0.31 (0.45)	586	2.38 (2.16)	14.0 (12.7)
	Off-rd truck	39	8	22.70 (20.59)	586	7.08 (6.42)	41.5 (37.6)
	D-5 dozer	17	8	17.40 (15.78)	586	2.37 (2.15)	13.9 (12.6)
	12-G grader	44	8	4.30 (3.90)	586	1.51 (1.37)	8.9 (8.1)
	Backhoe	3	8	9.10 (8.25)	586	0.22 (0.20)	1.3 (1.2)
	641-B scraper	23	8	23.15 (21.00)	586	4.26 (3.86)	25.0 (22.7)
	Compactor	50	8	3.35 (3.04)	586	1.34 (1.22)	7.9 (7.2)
	Pipelayer	3	8	7.15 (6.49)	586	0.17 (0.15)	1.0 (0.9)
	Paver	4	8	3.35 (3.04)	586	0.11 (0.10)	0.6 (0.5)
	Roller	8	8	3.35 (3.04)	586	0.21 (0.19)	1.3 (1.2)
Sub-Total		402				28.72 (26.05)	168.5 (152.8)
2	Spray truck	2	20 (12)	0.31 (0.45)	564	0.01 (0.01)	0.1 (0.1)
	Semi	1	500 (311)	0.31 (0.45)	564	0.16 (0.15)	0.9 (0.8)
	Tank truck	3	500 (311)	0.31 (0.45)	564	0.47 (0.43)	2.6 (2.4)
	Water truck	130	160 (99)	0.31 (0.45)	564	6.45 (5.85)	36.4 (33.0)
	Carry all	3	20(12)	—[2]	564	—	—
	30-ton truck	24	240 (149)	0.31 (0.45)	564	1.79 (1.62)	10.1 (9.2)
	Off-rd truck	31	8	22.70 (20.59)	564	—	—
	D-5 dozer	13	8	17.40 (15.78)	564	1.81 (1.64)	10.2 (9.3)
	12-G grader	34	8	4.30 (3.90)	564	1.17 (1.06)	6.6 (6.0)
	Backhoe	2	8	9.10 (8.25)	564	0.15 (0.14)	0.8 (0.7)
	641-B scraper	18	8	23.15 (21.00)	564	3.33 (3.02)	18.8 (17.1)
	Compactor	38	8	3.35 (3.04)	564	1.02 (0.93)	5.7 (5.2)
	Pipelayer	2	8	7.15 (6.49)	564	0.11 (0.10)	0.6 (0.5)
	Paver	3	8	3.35 (3.04)	564	0.08 (0.07)	0.5 (0.5)
	Roller	6	8	3.35 (3.04)	564	0.16 (0.15)	0.9 (0.8)
Sub-Total		310				22.34 (20.26)	126.0 (114.3)
3	Spray truck	2	20 (12)	0.31 (0.45)	586	0.01 (0.01)	0.1 (0.1)
	Semi	1	500 (311)	0.31 (0.45)	586	0.16 (0.15)	0.9 (0.8)
	Tank truck	3	500 (311)	0.31 (0.45)	586	0.47 (0.43)	2.7 (2.4)
	Water truck	149	160 (99)	0.31 (0.45)	586	7.39 (6.70)	43.3 (39.3)
	Carry all	3	20 (12)	—[2]	586	—	—
	30-ton truck	27	240 (149)	0.31 (0.45)	586	2.01 (1.82)	11.8 (10.7)
	Off-rd truck	34	8	22.70 (20.59)	586	6.17 (5.60)	36.2 (32.8)
	D-5 dozer	15	8	17.40 (15.78)	586	2.09 (1.90)	12.2 (11.1)
	12-G grader	39	8	4.30 (3.90)	586	1.34 (1.22)	7.9 (7.2)
	Backhoe	2	8	9.10 (8.25)	586	0.15 (0.14)	0.9 (0.8)
	641-B scraper	20	8	23.15 (21.00)	586	3.70 (3.36)	21.7 (19.7)
	Compactor	44	8	3.35 (3.04)	586	1.18 (1.07)	6.9 (6.3)
	Pipelayer	2	8	7.15 (6.49)	586	0.11 (0.10)	0.7 (0.6)
	Paver	3	8	3.35 (3.04)	586	0.08 (0.07)	0.5 (0.5)
	Roller	7	8	3.35 (3.04)	586	0.19 (0.17)	1.1 (1.0)
Sub-Total		351				25.05 (22.72)	(146.9 (133.2)
4	Spray truck	2	20 (12)	0.31 (0.45)	500	0.01 (0.01)	0.1 (0.1)
	Semi	1	500 (311)	0.31 (0.45)	500	0.16 (0.15)	0.8 (0.7)
	Tank truck	3	500 (311)	0.31 (0.45)	500	0.47 (0.43)	2.3 (2.1)
	Water truck	158	160 (99)	0.31 (0.45)	500	7.84 (7.11)	39.2 (35.6)
	Carry all	3	20 (12)	—[2]	500	—	—
	30-ton truck	29	240 (149)	0.31 (0.45)	500	2.16 (1.96)	10.8 (9.8)
	Off-rd truck	36	8	22.70 (20.59)	500	6.54 (5.93)	32.7 (29.7)
	D-5 dozer	16	8	17.40 (15.78)	500	2.23 (2.02)	11.1 (10.1)
	12-G grader	41	8	4.30 (3.90)	500	1.41 (1.28)	7.1 (6.4)
	Backhoe	3	8	9.10 (8.25)	500	0.22 (0.20)	1.1 (1.0)
	641-B scraper	21	8	23.15 (21.00)	500	3.89 (3.53)	19.4 (17.6)
	Compactor	46	8	3.35 (3.04)	500	1.23 (1.12)	6.2 (5.6)
	Pipelayer	3	8	7.15 (6.49)	500	0.17 (0.15)	0.9 (0.8)
	Paver	4	8	3.35 (3.04)	500	0.11 (0.10)	0.5 (0.5)
	Roller	7	8	3.35 (3.04)	500	0.19 (0.17)	0.9 (0.8)
Sub-Total		373				26.63 (24.15)	133.1 (120.7)
Total		1,436				102.74 (93.19)	574.5 (521.1)

[1]All vehicles are diesel powered except carry-alls.

[2]SO_x emissions for this category are relatively insignificant.

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Table 4.1.2.2-13. SO_x emissions associated with cluster road construction.

1 SEGMENT NUMBER	2 VEHICLE TYPE[1]	3 NUMBER OF VEHICLES	4 DISTANCE TRAVELED mi/day (km/day) OR OPERATING TIME hr/day	5 EMISSION FACTOR x 10^{-5} tons/mi (tonnes/km) OR tons/hr (tonnes/hr)	6 NUMBER OF CONSTRUCTION DAYS	7 EMISSIONS PER DAY x 10^{-2} tons (tonnes) (3.) x (4.) x (5.)	8 TOTAL EMISSIONS tons (tonnes) (3.) x (4.) x (5.) x (6.)
1	Semi	2	500 (311)	0.31 (0.45)	1151	0.31 (0.28)	3.6 (3.3)
	Tank truck	3	500 (311)	0.31 (0.45)	1151	0.47 (0.43)	5.4 (4.9)
	Water truck	233	160 (99)	0.31 (0.45)	1151	11.56 (10.48)	133.0 (120.6)
	Carry all	6	20 (12)	—[2]	1151	—	—
	Off road truck	73	8	22.70 (20.59)	1151	13.26 (12.03)	152.6 (138.4)
	641-B scraper	8	8	23.15 (21.00)	1151	1.48 (1.34)	17.1 (15.5)
	D-5 dozer	13	8	17.40 (15.78)	1151	1.81 (1.64)	20.8 (18.9)
	12-G grader	40	8	4.30 (3.90)	1151	1.38 (1.25)	15.8 (14.3)
	Backhoe	5	8	9.10 (8.25)	1151	0.36 (0.33)	4.2 (3.8)
	Spreader	1	8	3.35 (3.04)	1151	0.03 (0.03)	0.3 (0.3)
	Compactor	61	8	3.35 (3.04)	1151	1.63 (1.48)	18.8 (17.1)
	Pipe layer	5	8	7.15 (6.49)	1151	0.29 (0.26)	3.3 (3.0)
Sub-Total		450				32.58 (29.55)	374.9 (340.0)
2	Semi	1	500 (311)	0.31 (0.45)	934	0.16 (0.15)	1.4 (1.3)
	Tank truck	3	500 (311)	0.31 (0.45)	934	0.47 (0.43)	4.3 (3.9)
	Water truck	179	160 (99)	0.31 (0.45)	934	8.88 (8.05)	82.9 (75.2)
	Carry all	4	20 (12)	—[2]	934	—	—
	Off road truck	56	8	22.70 (20.59)	934	10.17 (9.22)	95.0 (86.2)
	641-B scrapper	7	8	23.15 (21.00)	934	14.26 (12.93)	133.2 (120.8)
	D-5 dozer	10	8	17.40 (15.78)	934	1.39 (1.26)	13.0 (11.8)
	12-G grader	30	8	4.30 (3.90)	934	1.03 (0.93)	9.6 (8.7)
	Backhoe	4	8	9.10 (8.25)	934	0.29 (0.26)	2.7 (2.4)
	Spreader	1	8	3.35 (3.04)	934	0.03 (0.03)	0.3 (0.3)
	Compactor	47	8	3.35 (3.04)	934	1.26 (1.14)	11.8 (10.7)
	Pipelayer	4	8	7.15 (6.49)	934	0.23 (0.21)	2.1 (1.9)
Sub-Total		346				38.17 (34.62)	356.3 (323.2)
3	Semi	2	500 (311)	0.31 (0.45)	826	0.31 (0.28)	2.6 (2.4)
	Tank truck	3	500 (311)	0.31 (0.45)	826	0.47 (0.43)	3.8 (3.4)
	Water truck	204	160 (99)	0.31 (0.45)	826	10.12 (9.18)	83.6 (75.8)
	Carry all	5	20 (12)	—[2]	826	—	—
	Off road truck	64	8	22.70 (20.59)	826	11.62 (10.54)	96.0 (87.1)
	641-B scraper	7	8	23.15 (21.00)	826	1.30 (1.18)	10.7 (9.7)
	D-5 dozer	12	8	17.40 (15.78)	826	1.67 (1.51)	13.8 (12.5)
	12-G grader	35	8	4.30 (3.90)	826	1.20 (1.09)	9.9 (9.0)
	Backhoe	4	8	9.10 (8.25)	826	0.29 (0.26)	2.4 (2.2)
	Spreader	1	8	3.35 (3.04)	826	0.03 (0.03)	0.2 (0.2)
	Compactor	53	8	3.35 (3.04)	826	1.42 (1.29)	11.7 (10.6)
	Pipelayer	4	8	7.15 (6.49)	826	0.23 (0.21)	1.9 (1.7)
Sub-Total		394				28.66 (25.99)	236.6 (214.6)
4	Semi	2	500 (311)	0.31 (0.45)	956	0.31 (0.28)	3.0 (2.7)
	Tank truck	3	500 (311)	0.31 (0.45)	956	0.47 (0.43)	4.4 (4.0)
	Water truck	216	160 (99)	0.31 (0.45)	956	10.71 (9.71)	102.4 (92.9)
	Carry all	5	20 (12)	—[2]	956	—	—
	Off road truck	67	8	22.70 (20.59)	956	12.17 (11.04)	116.3 (105.5)
	641-B scraper	8	8	23.15 (21.00)	956	1.48 (1.34)	14.2 (12.9)
	D-5 dozer	13	8	17.40 (15.78)	956	1.81 (1.64)	17.3 (15.7)
	12-G grader	37	8	4.30 (3.90)	956	1.27 (1.15)	12.2 (11.1)
	Backhoe	4	8	9.10 (8.25)	956	0.29 (0.26)	2.8 (2.5)
	Spreader	1	8	3.35 (3.04)	956	0.03 (0.03)	0.3 (0.3)
	Compactor	57	8	3.35 (3.04)	956	1.53 (1.39)	14.6 (13.2)
	Pipelayer	4	8	7.15 (6.49)	956	0.23 (0.21)	2.2 (2.0)
Sub-Total		417				30.30 (27.48)	289.7 (262.8)
Total		1,607				129.71 (117.65)	1,257.5 (1,140.6)

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[1]All vehicles are diesel powered except carry-alls.

[2]SO_x emissions for this category are relatively insignificant.

Table 4.1.2.2-14. SO_x emissions associated with shelter construction.

1 SEGMENT NUMBER	2 VEHICLE TYPE[1]	3 NUMBER OF VEHICLES	4 DISTANCE TRAVELED mi/day (km/day) OR OPERATING TIME hr/day	5 EMISSION FACTOR x 10^{-5} tons/mi (tonnes/km) OR tons/hr (tonnes/hr)	6 NUMBER OF CONSTRUCTION DAYS	7 EMISSIONS PER DAY x 10^{-2} tons (tonnes) (3.)X(4.)X(5.)	8 TOTAL EMISSIONS tons (tonnes) (3.)X(4.)X(5.)X(6.)
1	32-ton Truck	3	500 (311)	0.31 (0.45)	1,239	0.47 (0.43)	5.7 (5.2)
	Concrete Truck	50	150 (93)	0.31 (0.45)	1,239	2.33 (2.11)	28.8 (26.1)
	Semi	2	500 (311)	0.31 (0.45)	1,239	0.31 (0.28)	3.8 (3.4)
	Water Truck	224	160 (99)	0.31 (0.45)	1,239	11.11 (10.08)	137.7 (124.9)
	Carry All	3	20 (12)	—[2]	1,239	—	—
	Flatbed Truck	12	20 (12)	0.31 (0.45)	1,239	0.07 (0.06)	0.9 (0.8)
	D-5 Dozer	10	8	17.40 (15.78)	1,239	1.39 (1.26)	17.2 (15.6)
	Compactor	3	8	3.35 (3.04)	1,239	0.08 (0.07)	1.0 (0.9)
	D-9 W/Ripper	4	8	4.30 (3.90)	1,239	0.14 (0.13)	1.7 (1.5)
	641-B Scraper	6	8	23.15 (21.00)	1,239	1.11 (1.01)	13.8 (12.[illegible])
	12-G Grader	2	8	4.30 (3.90)	1,239	0.07 (0.06)	0.9 (0.8)
Sub Total		319				17.08 (15.49)	211.5 (191.8)
2	32-ton Truck	3	500 (311)	0.31 (0.45)	1,173	0.47 (0.43)	5.5 (5.[illegible])
	Concrete Truck	39	150 (93)	0.31 (0.45)	1,173	1.81 (1.64)	21.3 (19.3)
	Semi	1	500 (311)	0.31 (0.45)	1,173	0.16 (0.15)	1.8 (1.6)
	Water Truck	171	160 (99)	0.31 (0.45)	1,173	8.48 (7.69)	99.5 (90.2)
	Carry All	2	20 (12)	—[2]	1,173	—	—
	Flatbed Truck	10	20 (12)	0.31 (0.45)	1,173	0.06 (0.05)	0.7 (0.6)
	D-5 Dozer	7	8	17.40 (15.78)	1,173	0.97 (0.88)	11.4 (10.[illegible])
	Compactor	2	8	3.35 (3.04)	1,173	0.05 (0.05)	0.6 (0.5)
	D-9 W/Ripper	4	8	4.30 (3.90)	1,173	0.14 (0.13)	1.6 (1.5)
	641-B Scraper	5	8	23.15 (21.00)	1,173	0.93 (0.84)	10.9 (9.9)
	12-G Grader	1	8	4.30 (3.90)	1,173	0.03 (0.03)	0.4 (0.4)
Sub Total		245				13.10 (11.88)	153.7 (139.4)
3	32-ton Truck	3	500 (311)	0.31 (0.45)	1,043	0.47 (0.43)	4.8 (4.4)
	Concrete Truck	44	150 (93)	0.31 (0.45)	1,043	2.05 (1.86)	21.3 (19.[illegible])
	Semi	1	500 (311)	0.31 (0.45)	1,043	0.16 (0.15)	1.6 (1.5)
	Water Truck	196	160 (99)	0.31 (0.45)	1,043	9.72 (8.82)	101.4 (92.[illegible])
	Carry All	2	20 (12)	—[2]	1,043	—	—
	Flatbed Truck	11	20 (12)	0.31 (0.45)	1,043	0.07 (0.06)	0.7 (0.6)
	D-5 Dozer	8	8	17.40 (15.78)	1,043	1.11 (1.01)	11.6 (10.5)
	Compactor	2	8	3.35 (3.04)	1,043	0.05 (0.05)	0.6 (0.5)
	D-9 W/Ripper	4	8	4.30 (3.90)	1,043	0.14 (0.13)	1.4 (1.3)
	641-B Scrapper	5	8	23.15 (21.00)	1,043	0.93 (0.84)	9.7 (8.8)
	12-G Grader	1	8	4.30 (3.90)	1,043	0.03 (0.03)	0.4 (0.4)
Sub Total		277				14.73 (13.36)	153.5 (139.2)
4	32-ton Truck	3	500 (311)	0.31 (0.45)	1,043	0.47 (0.43)	4.8 (4.4)
	Concrete Truck	47	150 (93)	0.31 (0.45)	1,043	2.19 (1.99)	22.8 (20.[illegible])
	Semi	1	500 (311)	0.31 (0.45)	1,043	0.16 (0.15)	1.6 (1.5)
	Water Truck	208	160 (99)	0.31 (0.45)	1,043	10.32 (9.36)	107.6 (97.6)
	Carry All	3	20 (12)	—[2]	1,043	—	—
	Flatbed Truck	11	20 (12)	0.31 (0.45)	1,043	0.07 (0.06)	0.7 (0.6)
	D-5 Dozer	9	8	17.40 (15.78)	1,043	1.25 (1.13)	13.1 (11.9)
	Compactor	3	8	3.35 (3.04)	1,043	0.08 (0.07)	0.8 (0.7)
	D-9 W/Ripper	4	8	4.30 (3.90)	1,043	0.14 (0.13)	1.4 (1.3)
	641-B Scrapper	6	8	23.15 (21.00)	1,043	1.11 (1.01)	11.6 (10.5)
	12-G Grader	1	8	4.30 (3.90)	1,043	0.03 (0.03)	0.4 (0.4)
Sub Total		296				15.82 (14.35)	164.8 (149.5)
TOTAL		1,137				60.73 (55.08)	683.5 (619.9)

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[1]All vehicles are diesel powered except carry-alls.

[2]SO_x emissions for this category are relatively insignificant.

Table 4.1.2.2-15. HC emissions associated with DTN construction.

1 SEGMENT NUMBER	2 VEHICLE TYPE[1]	3 NUMBER OF VEHICLES	4 DISTANCE TRAVELED mi/day (km/day) OR OPERATING TIME hr/day	5 EMISSION FACTOR x 10^{-5} tons/mi (tonnes/km) OR tons/hr (tonnes/hr)	6 NUMBER OF CONSTRUCTION DAYS	7 EMISSIONS PER DAY X 10[illegible] tons (tonnes) (3.) x (4.) x (5.)	8 TOTAL EMISSIONS tons (tonnes) (3.) x (4.) x (5.) x (6.)
1	Spray Truck	2	20 (12)	0.50 (0.73)	586	0.02 (0.02)	0.1 (0.1)
	Semi	1	500 (311)	0.50 (0.73)	586	0.25 (0.23)	1.5 (1.4)
	Tank truck	3	500 (311)	0.50 (0.73)	586	0.75 (0.68)	4.4 (4.0)
	Water truck	170	160 (99)	0.50 (0.73)	586	13.60 (12.34)	79.7 (72.3)
	Carry all	3	20 (12)	0.39 (0.57)[2]	586	0.02 (0.02)	0.1 (0.1)
	30-ton truck	32	240 (149)	0.50 (0.73)	586	3.84 (3.48)	22.5 (20.4)
	Off road truck	39	8	21.85 (19.82)	586	6.82 (6.19)	39.9 (36.2)
	D-5 dozer	17	8	11.70 (10.61)	586	1.59 (1.44)	9.3 (8.4)
	12-G grader	44	8	2.70 (2.45)	586	0.95 (0.86)	5.6 (5.1)
	Backhoe	3	8	9.35 (8.48)	586	0.22 (0.20)	1.3 (1.2)
	641-B scraper	23	8	31.30 (28.39)	586	5.75 (5.22)	33.7 (30.6)
	Compactor	50	8	2.70 (2.45)	586	1.08 (0.98)	6.3 (5.7)
	Pipelayer	3	8	7.85 (7.12)	586	0.19 (0.17)	1.1 (1.0)
	Paver	4	8	2.70 (2.45)	586	0.09 (0.08)	0.5 (0.5)
	Roller	8	8	2.70 (2.45)	586	0.17 (0.15)	1.0 (0.9)
Sub-Total		402				35.35 (32.06)	207.0 (187.7)
2	Spray truck	2	20 (12)	0.50 (0.73)	564	0.02 (0.02)	0.1 (0.1)
	Semi	1	500 (311)	0.50 (0.73)	564	0.25 (0.23)	1.4 (1.3)
	Tank truck	3	500 (311)	0.50 (0.73)	564	0.75 (0.68)	4.2 (3.8)
	Water truck	130	160 (99)	0.50 (0.73)	564	10.40 (9.43)	58.7 (53.2)
	Carry all	3	20 (12)	0.39 (0.57)[2]	564	0.02 (0.02)	0.1 (0.1)
	30-ton truck	24	240 (149)	0.50 (0.73)	564	2.88 (2.61)	16.2 (14.7)
	Off road truck	31	8	21.85 (19.82)	564	5.42 (4.92)	30.6 (27.6)
	D-5 dozer	13	8	11.70 (10.61)	564	1.22 (1.11)	6.9 (6.3)
	12-G grader	34	8	2.70 (2.45)	564	0.73 (0.66)	4.1 (3.7)
	Backhoe	2	8	9.35 (8.48)	564	0.15 (0.14)	0.8 (0.7)
	641-B scraper	18	8	31.30 (28.39)	564	4.51 (4.09)	25.4 (23.0)
	Compactor	38	8	2.70 (2.45)	564	0.82 (0.74)	4.6 (4.2)
	Pipelayer	2	8	7.85 (7.12)	564	0.13 (0.12)	0.7 (0.6)
	Paver	3	8	2.70 (2.45)	564	0.06 (0.05)	0.4 (0.4)
	Roller	6	8	2.70 (2.45)	564	0.13 (0.12)	0.7 (0.6)
Sub-Total		310				27.49 (24.93)	154.9 (140.5)
3	Spray truck	2	20 (12)	0.50 (0.73)	586	0.02 (0.02)	0.1 (0.1)
	Semi	1	500 (311)	0.50 (0.73)	586	0.25 (0.23)	1.5 (1.4)
	Tank truck	3	500 (311)	0.50 (0.73)	586	0.75 (0.68)	4.4 (4.0)
	Water truck	149	160 (99)	0.50 (0.73)	586	11.92 (10.81)	69.9 (63.4)
	Carry all	3	20 (12)	0.39 (0.57)[2]	586	0.02 (0.02)	0.1 (0.1)
	30-ton truck	27	240 (149)	0.50 (0.73)	586	3.24 (2.94)	19.0 (17.2)
	Off road truck	34	8	21.85 (19.82)	586	5.94 (5.39)	34.8 (31.6)
	D-5 dozer	15	8	11.70 (10.61)	586	1.40 (1.27)	8.2 (7.4)
	12-G grader	39	8	2.70 (2.45)	586	0.84 (0.76)	4.9 (4.4)
	Backhoe	2	8	9.35 (8.48)	586	0.15 (0.14)	0.9 (0.8)
	641-B scraper	20	8	31.30 (28.39)	586	5.01 (4.54)	29.3 (26.6)
	Compactor	44	8	2.70 (2.45)	586	0.95 (0.86)	5.6 (5.1)
	Pipelayer	2	8	7.85 (7.12)	586	0.13 (0.12)	0.7 (0.6)
	Paver	3	8	2.70 (2.45)	586	0.06 (0.05)	0.4 (0.4)
	Roller	7	8	2.70 (2.45)	586	0.15 (0.14)	0.9 (0.8)
Sub-Total		351				30.83 (27.96)	180.7 (163.9)
4	Spray truck	2	20 (12)	0.50 (0.73)	500	0.02 (0.02)	0.1 (0.1)
	Semi	1	500 (311)	0.50 (0.73)	500	0.25 (0.23)	1.3 (1.2)
	Tank truck	3	500 (311)	0.50 (0.73)	500	0.75 (0.68)	3.8 (3.4)
	Water truck	158	160 (99)	0.50 (0.73)	500	12.64 (11.46)	63.2 (57.3)
	Carry all	3	20 (12)	0.39 (0.57)[2]	500	0.02 (0.02)	0.1 (0.1)
	30-ton truck	29	240 (149)	0.50 (0.73)	500	3.48 (3.16)	17.4 (15.8)
	Off road truck	36	8	21.85 (19.82)	500	6.29 (5.71)	31.5 (28.6)
	D-5 dozer	16	8	11.70 (10.61)	500	1.50 (1.36)	7.5 (6.8)
	12-G grader	41	8	2.70 (2.45)	500	0.89 (0.81)	4.4 (4.0)
	Backhoe	3	8	9.35 (8.48)	500	0.22 (0.20)	1.1 (1.0)
	641-B scraper	21	8	31.30 (28.39)	500	5.26 (4.77)	26.3 (23.9)
	Compactor	46	8	2.70 (2.45)	500	0.99 (0.90)	5.0 (4.5)
	Pipelayer	3	8	7.85 (7.12)	500	0.19 (0.17)	0.9 (0.8)
	Paver	4	8	2.70 (2.45)	500	0.09 (0.08)	0.4 (0.4)
	Roller	7	8	2.70 (2.45)	500	0.15 (0.14)	0.8 (0.7)
Sub-Total		373				32.74 (29.70)	163.8 (148.6)
Total		1,436				126.41 (114.65)	706.4 (640.7)

[1]All vehicles are diesel powered except carry-alls.

[2]Evaporative and crankcase hydrocarbon emission factors included.

Table 4.1.2.2-16. HC emissions associated with cluster road construction.

1	2	3	4	5	6	7	8
SEGMENT NO.	VEHICLE TYPE[1]	NO. OF VEHICLES	DIST. TRAVELED mi/day (km/day) OR OPERATING TIME hr/day	EMISSION FACTOR x 10 $^{-5}$ tons/mi (tonnes/km) OR tons/hr (tonnes/hr)	NO. OF CONSTRUCTION DAYS	PER DAY x 10 $^{-2}$ tons (tonnes) (3.) x (4.) x (5.)	TOTAL EMISSIONS tons (tonnes) (3.) x (4.) x (5.) x (6.)
	Semi	2	500 (311)	0.50 (0.73)	1,151	0.50 (0.45)	5.8 (5.3)
	Tank Truck	3	500 (311)	0.50 (0.73)	1,151	0.75 (0.68)	8.6 (7.8)
	Water Truck	233	160 (99)	0.50 (0.73)	1,151	18.64 (16.91)	214.5 (194.6)
	Carry All	6	20 (12)	0.39 (.57)[2]	1,151	0.05 (0.05)	0.5 (0.5)
	Off Road Truck	73	8	21.85 (19.82)	1,151	12.76 (11.57)	146.9 (133.2)
	641-B Scraper	8	8	31.30 (18.39)	1,151	2.00 (1.81)	23.1 (21.0)
1	D-5 Dozer	13	8	11.70 (10.61)	1,151	1.22 (1.11)	14.0 (12.7)
	12-G Grader	40	8	2.70 (2.45)	1,151	0.86 (0.78)	9.9 (9.0)
	Backhoe	5	8	9.35 (8.48)	1,151	0.37 (0.34)	4.3 (3.9)
	Spreader	1	8	2.70 (2.45)	1,151	0.02 (0.02)	0.2 (0.2)
	Compactor	61	8	2.70 (2.45)	1,151	1.32 (1.20)	15.2 (13.8)
	Pipelayer	5	8	7.85 (7.12)	1,151	0.31 (0.28)	3.6 ((3.3)
Subtotal		450				38.80 (35..9)	446.6 (405.1)
	Semi	1	500 (311)	0.50 (0.73)	934	0.25 (0.23)	2.3 (2.1)
	Tank Truck	3	500 (311)	0.50 (0.73)	934	0.75 (0.68)	7.0 (6.3)
	Water Truck	179	160 (99)	0.50 (0.73)	934	14.32 (12.99)	133.7 (121.3)
	Carry All	4	20 (12)	0.39 (0.57)[2]	934	0.03 (0.03)	0.3 (0.3)
	Off Road Truck	56	8	21.85 (19.82)	934	9.79 (8.88)	91.4 (82.9)
	641-B Scraper	7	8	31.30 (28.39)	934	1.75 (1.59)	16.4 (14.9)
2	D-5 Dozer	10	8	11.70 (10.61)	934	0.94 (0.85)	8.7 (7.9)
	12-G Grader	30	8	2.70 (2.45)	934	0.65 (0.59)	6.1 (5.5)
	Backhoe	4	8	9.35 (8.48)	934	0.30 (0.27)	2.8 (2.5)
	Spreader	1	8	2.70 (2.45)	934	0.02 (0.02)	0.2 (0.2)
	Compactor	47	8	2.70 (2.45)	934	1.02 (0.93)	9.5 (8.6)
	Pipelayer	4	8	7.85 (7.12)	934	0.25 (0.23)	2.3 (2.1)
Subtotal		346				30.07 (27.27)	280.7 (254.6)
	Semi	4	500 (311)	0.50 (0.73)	826	0.50 (0.45)	4.1 (3.7)
	Tank Truck	3	500 (311)	0.50 (0.73)	826	0.75 (0.68)	6.2 (5.6)
	Water Truck	204	160 (99)	0.50 (0.73)	826	16.32 (14.80)	134.8 (122.3)
	Carry All	5	20 (12)	0.39 (0.57)[2]	826	0.04 (0.04)	0.3 (0.3)
	Off Road Truck	64	8	21.85 (19.82)	826	11.19 (10.15)	92.4 (83.8)
3	641-B Scraper	7	8	31.30 (28.39)	826	1.75 (1.59)	14.5 (13.2)
	D-5 Dozer	12	8	11.70 (10.61)	826	1.12 (1.02)	9.3 (8.4)
	12-G Grader	35	8	2.70 (2.45)	826	0.76 (0.69)	6.2 (5.6)
	Backhoe	4	8	9.35 (8.48)	826	0.30 (0.27)	2.5 (2.3)
	Spreader	1	8	2.70 (2.45)	826	0.02 (0.02)	0.2 (0.2)
	Compactor	53	8	2.70 (2.45)	826	1.14 (1.03)	9.5 (8.6)
	Pipelayer	4	8	7.85 (7.12)	826	0.25 (0.23)	2.1 (1.9)
Subtotal		394				34.14 (30.96)	282.1 (255.9)
	Semi	2	500 (311)	0.50 (0.73)	956	0.50 (0.45)	4.8 (4.4)
	Tank Truck	3	500 (311)	0.50 (0.73)	956	0.75 (0.68)	7.2 (6.5)
	Water Truck	216	160 (99)	0.50 (0.73)	956	17.28 (15.67)	165.2 (149.8)
	Carry All	5	20 (12)	0.39 (0.57)[2]	956	0.04 (0.04)	0.4 (0.4)
	Off Road Truck	67	8	21.85 (19.82)	956	11.71 (10.62)	112.0 (101.6)
	641-B Scraper	8	8	31.30 (28.39)	956	2.00 (1.81)	19.2 (17.4)
	D-5 Dozer	13	8	11.70 (10.61)	956	1.22 (1.11)	11.6 (10.5)
	12-G Scraper	37	8	2.70 (2.45)	956	0.80 (0.73)	7.6 (6.9)
	Backhoe	4	8	9.35 (8.45)	956	0.30 (0.27)	2.9 (2.6)
	Spreader	1	8	2.70 (2.45)	956	0.02 (0.02)	0.2 (0.2)
	Compactor	57	8	2.70 (2.45)	956	1.23 (1.12)	11.8 (10.7)
	Pipelayer	4	8	7.85 (7.12)	956	0.25 (0.23)	2.4 (2.2)
Subtotal		417				36.10 (32.74)	345.3 (313.2)
TOTAL		1,607				139.11 (126.17)	1,[illegible]4.7 (1,228.7

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[1]All vehicles are diesel powered except carry-alls.
[2]Evaporative and crankcase hydrocarbon emission factors included.

Table 4.1.2.2-17. HC emissions associated with shelter construction.

1 SEGMENT NUMBER	2 VEHICLE TYPE[1]	3 NUMBER OF VEHICLES	4 DISTANCE TRAVELED mi/day (km/day) OR OPERATING TIME hr/day	5 EMISSION FACTOR $\times 10^{-5}$ tons/mi (tonnes/km) OR tons/hr (tonnes/hr)	6 NUMBER OF CONSTRUCTION DAYS	7 EMISSIONS PER DAY $\times 10^{-2}$ tons (tonnes) (3.) x (4.) x (5.)	8 TOTAL EMISSIONS tons (tonnes) (3.) x (4.) x (5.) x (6.)
1	32-ton truck	3	500 (311)	0.50 (0.73)	1239	0.75 (0.68)	9.3 (8.3)
	Concrete truck	50	150 (93)	0.50 (0.73)	1239	3.75 (3.40)	46.5 (42.2)
	Semi	2	500 (311)	0.50 (0.73)	1239	0.50 (0.45)	6.2 (5.6)
	Water truck	224	160 (99)	0.50 (0.73)	1239	17.92 (16.25)	222.0 (201.4)
	Carry all	3	20 (12)	0.39 (0.57)[2]	1239	0.02 (0.02)	0.3 (0.3)
	Flatbed truck	12	20 (12)	0.50 (0.73)	1239	0.12 (0.11)	1.5 (1.4)
	D-5 dozer	10	8	11.70 (10.61)	1239	0.94 (0.85)	11.6 (10.5)
	Compactor	3	8	2.70 (2.45)	1239	0.06 (0.05)	0.8 (0.7)
	D-9 w/ripper	4	8	2.70 (2.45)	1239	0.09 (0.08)	1.1 (1.0)
	641-B scraper	6	8	31.30 (28.39)	1239	1.50 (1.36)	18.6 (16.9)
	12-G grader	2	8	2.70 (2.45)	1239	0.04 (0.04)	0.5 (0.5)
Sub-total		319				25.69 (23.30)	318.4 (288.8)
2	32-ton truck	3	500 (311)	0.50 (0.73)	1173	0.75 (0.68)	8.8 (8.0)
	Concrete truck	39	150 (93)	0.50 (0.73)	1173	2.93 (2.66)	34.3 (31.1)
	Semi	1	500 (311)	0.50 (0.73)	1173	0.25 (0.23)	2.9 (2.6)
	Water truck	171	160 (99)	0.50 (0.73)	1173	13.68 (12.41)	160.5 (145.6)
	Carry all	2	20 (12)	0.39 (0.57)[2]	1173	0.02 (0.02)	0.2 (0.2)
	Flatbed truck	10	20 (12)	0.50 (0.73)	1173	0.10 (0.09)	1.2 (1.1)
	D-5 Dozer	7	8	11.70 (10.61)	1173	0.66 (0.60)	7.7 (7.0)
	Compactor	2	8	2.70 (2.45)	1173	0.04 (0.04)	0.5 (0.5)
	D-9 w/ripper	4	8	2.70 (2.45)	1173	0.09 (0.08)	1.0 (0.8)
	641-B scraper	5	8	31.30 (28.39)	1173	1.25 (1.13)	14.7 (13.3)
	12-G grader	1	8	2.70 (2.45)	1173	0.02 (0.02)	0.3 (0.3)
Sub-total		245				19.79 (17.95)	302.1 (274.0)
3	32-ton truck	3	500 (311)	0.50 (0.73)	1043	0.75 (0.68)	7.8 (7.1)
	Concrete truck	44	150 (93)	0.50 (0.73)	1043	3.30 (2.99)	34.4 (31.2)
	Semi	1	500 (311)	0.50 (0.73)	1043	0.25 (0.23)	2.6 (2.4)
	Water truck	196	160 (99)	0.50 (0.73)	1043	15.68 (14.22)	163.5 (148.3)
	Carry all	2	20 (12)	0.39 (0.57)[2]	1043	0.02 (0.02)	0.2 (0.2)
	Flatbed truck	11	20 (12)	0.50 (0.73)	1043	0.11 (0.10)	1.1 (1.0)
	D-5 dozer	8	8	11.70 (10.61)	1043	0.75 (0.68)	7.8 (7.1)
	Compactor	2	8	2.70 (2.45)	1043	0.04 (0.04)	0.5 (0.5)
	D-9 w/ripper	4	8	2.70 (2.45)	1043	0.09 (0.08)	0.9 (0.8)
	641-B scraper	5	8	31.30 (28.39)	1043	1.25 (1.13)	13.1 (11.9)
	12-G grader	1	8	2.70 (2.45)	1043	0.02 (0.02)	0.2 (0.2)
Sub-total		277				22.26 (20.19)	232.1 (210.5)
4	32-ton truck	3	500 (311)	0.50 (0.73)	1043	0.75 (0.68)	7.8 (7.1)
	Concrete truck	47	150 (93)	0.50 (0.73)	1043	3.53 (3.20)	36.8 (33.4)
	Semi	1	500 (311)	0.50 (0.73)	1043	0.25 (0.23)	2.6 (2.4)
	Watertruck	208	160 (99)	0.50 (0.73)	1043	16.64 (15.09)	173.6 (157.5)
	Carry all	3	20 (12)	0.39 (0.57)[2]	1043	0.02 (0.02)	0.2 (0.2)
	Flatbed truck	11	20 (12)	0.50 (0.73)	1043	0.11 (0.10)	1.1 (1.0)
	D-5 dozer	9	8	11.70 (10.61)	1043	0.84 (0.76)	8.8 (8.0)
	Compactor	3	8	2.70 (2.45)	1043	0.06 (0.05)	0.7 (0.6)
	D-9 w/ripper	4	8	2.70 (2.45)	1043	0.09 (0.08)	0.9 (0.8)
	641-B scraper	6	8	31.30 (28.39)	1043	1.50 (1.36)	15.7 (14.2)
	12-G grader	1	8	2.70 (2.45)	1043	0.02 (0.02)	0.2 (0.2)
Sub-total		296				23.81 (21.60)	248.4 (225.3)
Total		1,137				91.55 (83.04)	1,101.0 (998.6)

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[1]All vehicles are diesel powered except carry-alls.

[2]Evaporative and crankcase hydrocarbon emission factors included.

value emission rates based on Federal Testing Procedure (FTP) conditions. The FTP conditions under which the light-duty vehicles were tested are as follows:

1. Ambient temperature = 75°F average (68°F - 86°F)
2. Absolute humidity = 75 grains
3. Average speed = 20 mph, 18% idle operation
4. Average cold operation = 21%
5. Average hot-start operation = 27%
6. Average stabilized operation = 52%
7. Air-conditioning not in use
8. Vehicle contains driver only
9. Vehicle is not pulling a trailer
10. Vehicles receive typical in-use maintenance.

The testing for heavy-duty vehicles differed only in that 100 percent stabilized operation was used, and normal vehicle loading was allowed for.

For scenarios which vary from the FTP conditions, correction factors may be applied. Corrections are best handled by use of a computerized model, MOBILE 1, available from the U.S. Environmental Protection Agency. For present purposes, however, the mean value emission rates were considered as adequate. The rate for a particular pollutant and vehicle type was multiplied by the number of vehicles and by the miles per day of travel to determine a daily emission rate. The daily rate could then be multiplied by the number of construction days to determine total emissions. Summary tables of the emission rates are presented in Tables 4.1.2.2-18 through 4.1.2.2-22.

Generator Emissions (Gaseous and Particulate) (4.1.2.3)

Emissions from the generators located at concrete batch plants, asphaltic concrete plants, and sand and gravel processing plants are included in Tables 4.1.2.3-2 through 4.1.2.3-7. Generator emissions are calculated by considering the fuel needed to process or produce the required materials at each facility. Fuel use is multiplied by emission factors for each pollutant (Table 4.1.2.3-1) to obtain the total emission value. Daily emission rates are calculated by dividing the total emission value by the construction days. Generator daily emission rates are average values. NO_x emission rates are the largest, with annual rates approaching or exceeding 100 tons year.

OPERATING BASE: VEHICULAR EMISSIONS ON THE HIGHWAY FROM THE OPERATING BASE TO THE SUPPORT COMMUNITY (4.1.3)

Pollutant level increases in the area surrounding the operating base wi. occur due to increased flow of vehicle traffic throughout the region. The greatest concentration increases will be observed along the stretch of major highway which serves as the connecting link between the base and the support community. Traffic on this section of the highway will be a combination of the normal daily transient traffic flow and the base-related traffic. The cross-section of vehicle types traveling on the highway link is assumed to be representative of the national average vehicle mix as given in Table 4.1.3-1. Emission factors for these types of vehicles are presented in Table 4.1.3-2.

Table 4.1.2.2-18. Particulate emissions and emission rates for Nevada/Utah deployment area — mobile sources.

SEGMENT NO.	GROUP NO.	SHELTER CONSTRUCTION			CLUSTER ROAD CONSTRUCTION			DTN CONSTRUCTION		
		CONSTRUCTION TIME PERIOD (Number of Working Days)	TOTAL EMISSIONS tons (tonnes)	EMISSION RATE tons/day (tonnes/day)	CONSTRUCTION TIME PERIOD (Number of Working Days)	TOTAL EMISSIONS tons (tonnes)	EMISSION RATE tons/day (tonnes/day)	CONSTRUCTION TIME PERIOD (Number of Working Days)	TOTAL EMISSIONS tons (tonnes)	EMISSION RATE tons/day (tonnes/day)
	11	10/84-11/85 (282)	25.8 (23.4)	0.1 (0.1)	6/84- 4/85 (216)	45.6 (41.4)	0.2 (0.2)	1/84- 6/84 (105)	[illegible] (18.8)	[illegible] (0.2)
	4	6/85-11/86 (369)	33.8 (30.6)	0.1 (0.1)	4/85- 4/86 (261)	55.1 (50.0)	0.2 (0.2)	6/84-12/84 (136)	26.8 (24.3)	0.2 (0.2)
1	5	7/86- 8/87 (282)	25.8 (23.4)	0.1 (0.1)	4/86- 1/87 (195)	41.2 (37.4)	0.2 (0.2)	12/84- 4/85 (94)	18.5 (16.8)	[illegible] (0.2)
	6	5/87- 6/88 (282)	25.8 (23.4)	0.1 (0.1)	1/87-11/87 (216)	45.6 (41.4)	0.2 (0.2)	4/85-10/85 (115)	22.7 (20.6)	0.2 (0.2)
	12	3/88- 7/89 (347)	31.7 (28.8)	0.1 (0.1)	11/87-11/88 (261)	55.1 (50.0)	0.2 (0.2)	10/85- 4/86 (136)	26.8 (24.3)	0.2 (0.2)
	1	1/85-11/86 (477)	37.4 (34.0)	0.1 (0.1)	10/84- 4/86 (391)	68.4 (62.0)	0.2 (0.2)	5/84- 3/85 (210)	31.9 (28.9)	0.2 (0.2)
2	2	8/86- 2/38 (391)	30.7 (27.8)	0.1 (0.1)	4/86- 6/87 (304)	53.2 (48.2)	0.2 (0.2)	3/85-10/85 (157)	23.9 (21.6)	0.2 (0.2)
	3	10/87- 7/89 (456)	35.8 (32.5)	0.1 (0.1)	6/87- 5/88 (239)	41.8 (37.9)	0.2 (0.2)	10/85- 7/86 (197)	29.9 (27.2)	0.2 (0.2)
	9	7/85- 1/87 (391)	31.3 (28.4)	0.1 (0.1)	3/85- 5/86 (304)	48.8 (44.3)	0.2 (0.1)	10/94- 6/85 (179)	24.0 (21.8)	0.1 (0.1)
	10	9/86-11/87 (304)	24.3 (22.1)	0.1 (0.1)	5/86- 4/87 (239)	38.4 (34.8)	0.2 (0.1)	6/85- 1/86 (144)	19.3 (17.5)	0.1 (0.1)
3	8	7/87-10/88 (326)	26.1 (23.6)	0.1 (0.1)	4/87- 2/88 (216)	34.7 (31.5)	0.2 (0.1)	1/86- 7/86 (132)	17.7 (16.1)	0.1 (0.1)
	7	6/88- 7/89 (282)	22.6 (20.5)	0.1 (0.1)	2/88- 2/89 (261)	41.9 (38.0)	0.2 (0.1)	7/86- 1/87 (132)	17.7 (16.1)	0.1 (0.1)
	16	7/85- 9/86 (304)	26.2 (23.7)	0.1 (0.1)	3/85- 1/86 (216)	45.5 (41.2)	0.2 (0.2)	10/84- 3/85 (115)	21.0 (19.0)	0.2 (0.2)
	15	5/86- 9/87 (347)	29.9 (27.1)	0.1 (0.1)	1/86- 1/87 (261)	54.9 (49.8)	0.2 (0.2)	3/85- 9/85 (134)	24.4 (22.2)	0.2 (0.2)
4	14	5/87- 8/88 (326)	28.1 (25.5)	0.1 (0.1)	1/87-12/87 (239)	50.3 (45.6)	0.2 (0.2)	9/85- 3/86 (125)	22.8 (20.7)	0.2 (0.2)
	13	4/88- 7/89 (326)	28.1 (25.5)	0.1 (0.1)	12/87-11/88 (239)	50.3 (45.6)	0.2 (0.2)	3/86- 9/86 (125)	22.8 (20.7)	0.2 (0.2)

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Table 4.1.2.2-19. NO_x emissions and emission rates for Nevada/Utah deployment area (Page 1 of 2).

SEGMENT NO.	GROUP NO.	DTN CONSTRUCTION		
		CONSTRUCTION TIME PERIOD (NO. WORKING DAYS)	TOTAL EMISSIONS TONS (TONNES)	EMISSION RATE TONS/DAY (TONNES/DAY)
1	11	1/84 - 6/84 (105)	354.2 (321.3)	3.4 (3.1)
	4	6/84 - 12/84 (136)	458.8 (416.1)	3.4 (3.1)
	5	12/84 - 4/85 (94)	317.1 (287.6)	3.4 (3.1)
	6	4/85 - 10/85 (115)	387.9 (351.9)	3.4 (3.1)
	12	10/85 - 4/86 (136)	458.8 (416.1)	3.4 (3.1)
2	1	5/84 - 3/85 (210)	549.8 (498.7)	2.6 (2.4)
	2	3/85 - 10/85 (157)	411.1 (372.8)	2.6 (2.4)
	3	10/85 - 7/86 (197)	515.8 (467.8)	2.6 (2.4)
3	9	10/84 - 6/85 (179)	524.1 (475.3)	2.9 (2.7)
	10	6/85 - 1/86 (144)	421.6 (382.4)	2.9 (2.7)
	8	1/86 - 7/86 (132)	386.5 (350.5)	2.9 (2.7)
	7	7/86 - 1/87 (132)	386.5 (350.5)	2.9 (2.7)
4	16	10/84 - 3/85 (115)	359.6 (326.1)	3.1 (2.8)
	15	3/85 - 9/85 (134)	419.0 (380.0)	3.1 (2.8)
	14	9/85 - 3/86 (125)	390.8 (354.5)	3.1 (2.8)
	13	3/86 - 9/86 (125)	390.8 (354.5)	3.1 (2.8)

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Table 4.1.2.2-19. NO_x emissions and emission rates for Nevada/Utah deployment area (Page 2 of 2).

SEGMENT NO.	GROUP NO	SHELTER CONSTRUCTION: CONSTRUCTION TIME PERIOD (NO. WORKING DAYS)	SHELTER CONSTRUCTION: TOTAL EMISSIONS TONS (TONNES)	SHELTER CONSTRUCTION: EMISSION RATE TONS/DAY (TONNES/DAY)	CLUSTER ROAD CONSTRUCTION: CONSTRUCTION TIME PERIOD (NO. WORKING DAYS)	CLUSTER ROAD CONSTRUCTION: TOTAL EMISSIONS TONS (TONNES)	CLUSTER ROAD CONSTRUCTION: EMISSION RATE TONS/DAY (TONNES/DAY)
[illegible]	11	10/84 - 11/85 (282)	301.5 (273.5)	1.1 (1.0)	6/84 - 4/85 (216)	872.0 (790.9)	4.0 (3.7)
	4	6/85 - 11/86 (369)	394.5 (357.9)	1.1 (1.0	4/85 - 4/86 (261)	1,053.7 (955.7)	4.0 (3.7)
	5	7/86 - 8/87 (282)	301.5 (273.5)	1.1 (1.0)	4/86 - 1/87 (195)	787.2 (714.0)	4.0 (3.7)
	6	5/87 - 6/88 (282)	301.5 (273.5)	1.1 (1.0)	1/87 - 11/87 (216)	872.0 (790.0)	4.0 (3.7)
	12	3/88 - 7/89 (347)	371.0 (336.5)	1.1 (1.0)	11/87 - 11/88 (261)	1,053.7 (955.7)	4.0 (3.7)
2	1	1/85 - 11/86 (477)	435.4 (394.9)	0.9 (0.8)	10/84 - 4/86 (391)	1,218.6 (1,105.3)	3.1 (2.8
	2	8/86 - 2/88 (391)	356.9 (323.7)	0.9 (0.8)	4/86 - 6/87 (304)	947.5 (859.4)	3.1 (2.8)
	3	10/87 - 7/89 (456)	416.3 (377.5)	0.9 (0.8)	6/87 - 5/88 (239)	744.9 (675.6)	3.1 (2.8)
3	9	7/85 - 1/87 (391)	361.5 (327.8)	0.9 (0.8)	3/85 - 5/86 (304)	670.4 (789.4)	2.9 (2.6)
	10	9/86 - 11/87 (304)	281.0 (254.9)	0.9 (0.8)	5/86 - 4/87 (239)	684.3 (620.6)	2.9 (2.6)
	8	7/87 - 10/88 (326)	301.4 (273.3)	0.8 (0.8)	4/87 - 2/88 (216)	618.4 (560.9)	2.9 (2.6)
	7	6/88 - 7/89 (282)	260.7 (236.4)	0.9 (0.8)	2/88 - 2/89 (261)	747.3 (677.8)	2.9 (2.6)
4	16	7/85 - 9/86 (304)	305.7 (277.3)	1.0 (0.9)	3/85 - 1/86 (216)	808.6 (733.4)	3.7 (3.4)
	15	5/86 - 9/87 (347)	348.9 (316.5)	1.0 (0.9)	1/86 - 1/87 (261)	977.0 (886.1)	3.7 (3.4)
	14	5/87 - 8/88 (326)	327.8 (297.3)	1.0 (0.9)	1/87 - 12/87 (239)	894.7 (811.5)	3.7 (3.4)
	13	4/88 - 7/89 (326)	327.8 (297.3)	1.0 (0.9)	12/87 - 11/88 (239)	894.7 (811.5)	3.7 (3.4)

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Table 4.1.2.2-20. CO emissions and emission rates for Nevada/Utah deployment area — mobile sources.

SEGMENT NO.	GROUP NO.	SHELTER CONSTRUCTION			CLUSTER ROAD CONSTRUCTION			DTN CONSTRUCTION		
		CONSTRUCTION TIME PERIOD (Number of Working Days)	TOTAL EMISSIONS tons (tonnes)	EMISSION RATE tons/day (tonnes/day)	CONSTRUCTION TIME PERIOD (Number of Working Days)	TOTAL EMISSIONS tons (tonnes)	EMISSION RATE tons/day (tonnes/day)	CONSTRUCTION TIME PERIOD (Number of Working Days)	TOTAL EMISSIONS tons (tonnes)	EMISSION RATE tons/day (tonnes/day)
	11	10/84-11/85 (282)	308.5 (279.8)	1.1 (1.0)	6/84 - 4/85 (216)	368.8 (334.5)	1.7 (1.5)	1/84- 6/84 (105)	161.3 (146.3)	1.5 (1.4)
	4	6/85-11/86 (369)	403.7 (366.2)	1.1 (1.0)	4/85- 4/86 (261)	445.6 (404.2)	1.7 (1.5)	6/84-12/84 (136)	209.0 (189.5)	1.5 (1.4)
1	5	7/86- 8/87 (282)	308.5 (279.8)	1.1 (1.0)	4/86- 1/87 (195)	330.0 (302.0)	1.7 (1.5)	12/84- 4/85 (94)	144.4 (131.0)	1.5 (1.4)
	6	5/87- 6/88 (282)	308.5 (279.8)	1.1 (1.0)	1/87-11/87 (216)	368.8 (334.5)	1.7 (1.5)	4/85-10/85 (115)	176.7 (160.3)	1.5 (1.4)
	12	3/88- 7/89 (347)	379.6 (344.3)	1.1 (1.0)	11/87-1. '88 (261)	445.6 (404.2)	1.7 (1.5)	10/85- 4/86 (136)	209.0 (189.5)	1.5 (1.4)
	1	1/85-11/86 (477)	447.1 (405.5)	0.9 (0.9)	10/84- 4/86 (391)	505.1 (458.1)	1.3 (1.2)	5/84- 3/85 210)	253.1 (229.6)	1.2 (1.1)
2	2	8/86- 2/88 (391)	366.5 (332.4)	0.9 (0.9)	4/86- 6/87 (304)	392.7 (356.2)	1.3 (1.2)	3/85-10/85 (157)	189.3 (171.7)	1.2 (1.1)
	3	10/87- 7/89 (456)	427.4 (387.6)	0.9 (0.9)	6/87- 5/88 (239)	308.7 (280.0)	1.3 (1.2)	10/85- 7/86 (197)	237.5 (215.4)	1.2 (1.1)
	9	7/85- 1/87 (391)	386.5 (350.6)	1.0 (0.9)	3/85- 5/86 (304)	456.9 (414.4)	1.5 (1.4)	10/84- 6/85 (179)	238.8 (216.6)	1.3 (1.2)
	10	9/86-11/87 (304)	300.5 (272.6)	1.0 (0.9)	5/86- 4/87 (239)	359.2 (325.8)	1.5 (1.4)	6/85- 1/86 (144)	192.1 (174.3)	1.3 (1.2)
3	8	7/87-10/88 (326)	322.3 (292.3)	1.0 (0.9)	4/87- 2/88 (216)	324.7 (294.5)	1.5 (1.4)	1/86- 7/86 (132)	176.1 (159.7)	1.3 (1.3)
	7	6/88- 7/89 (282)	278.8 (252.8)	1.0 (0.9)	2/88- 2/89 (261)	392.3 (355.8)	1.5 (1.4)	7/86- 1/87 (132)	176.1 (159.7)	1.3 (1.2)
	16	7/85- 9/86 (304)	326.9 (296.5)	1.1 (1.0)	3/85- 1/86 (216)	357.7 (324.5)	1.7 (1.5)	10/84- 3/85 (115)	163.7 (148.5)	1.4 (1.3)
	15	5/86- 9/87 (347)	373.2 (338.5)	1.1 (1.0)	1/86- 1/87 (261)	432.3 (392.1)	1.7 (1.5)	3/85- 9/85 (134)	190.8 (173.0)	1.4 (1.3)
4	14	5/87- 8/88 (326)	350.6 (318.0)	1.1 (1.0)	1/87-12/87 (239)	395.8 (359.0)	1.7 (1.5)	9/85- 3/86 (125)	178.0 (161.4)	1.4 (1.3)
	13	4/88- 7/89 (326)	350.6 (318.0)	1.1 (1.0)	12/87-11/88 (239)	395.8 (359.0)	1.7 (1.5)	3/86- 9/86 (125)	178.0 (161.4)	1.4 (1.3)

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Table 4.1.2.2-21. SO_x emissions and emission rates for Nevada/Utah deployment area — mobile sources.

SEGMENT NO.	GROUP NO.	SHELTER CONSTRUCTION: CONSTRUCTION TIME PERIOD (Number of Working Days)	SHELTER CONSTRUCTION: TOTAL EMISSIONS tons (tonnes)	SHELTER CONSTRUCTION: EMISSION RATE tons/day (tonnes/day)	CLUSTER ROAD CONSTRUCTION: CONSTRUCTION TIME PERIOD (Number of Working Days)	CLUSTER ROAD CONSTRUCTION: TOTAL EMISSIONS tons (tonnes)	CLUSTER ROAD CONSTRUCTION: EMISSION RATE tons/day (tonnes/day)	DTN CONSTRUCTION: CONSTRUCTION TIME PERIOD Number of Working Days)	DTN CONSTRUCTION: TOTAL EMISSIONS tons (tonnes)	DTN CONSTRUCTION: EMISSION RATE tons/day (tonnes/day)
1	11	10/84-11/85 (282)	36.6 (33.2)	0.1 (0.1)	6/84- 4/85 (216)	68.9 (62.5)	0.3 (0.3)	1/84- 6/84 (105)	29.6 ([illegible])	0.3 (0.3)
	4	6/85-11/86 (369)	47.9 (43.4)	0.1 (0.1)	4/85-4/86 (261)	83.3 (75.5)	0.3 (0.3)	6/84-12/84 (136)	38.3 (34.7)	0.3 (0.3)
	5	7/86- 6/87 (282)	36.6 (33.2)	0.1 (0.1)	4/86- 1/87 (195)	62.2 (56.4)	0.3 (0.3)	12/84- 4/85 (94)	26.5 (24.0)	0.3 (0.3)
	6	5/87- 6/88 (282)	36.6 (33.2)	0.1 (0.1)	1/87-11/87 (216)	68.9 (62.5)	0.3 (0.3)	4/85-10.85 (115)	32.4 (29.4)	0.3 (0.3)
	12	3/88- 7/89 (347)	45.0 (40.9)	0.1 (0.1)	11/87-11/88 (261)	83.3 (75.5)	0.3 (0.3)	10/85- 4/86 (136)	38.3 (34.7)	0.3 (0.3)
2	1	1.85-11/86 (477)	53.0 (48.0)	0.1 (0.1)	10/84- 4/86 (391)	147.0 (133.3)	0.4 (0.3)	5/84- 3/85 (210)	45.7 (41.5)	0.2 (0.2)
	2	8/86- 2/88 (391)	43.4 (39.4)	0.1 (0.1)	4/86-6/87 (304)	114.3 (103.6)	0.4 (0.3)	3/85-10/85 (157)	34.2 (31.0)	0.2 (0.2)
	3	10/87- 7/89 (456)	50.6 (45.9)	0.1 (0.1)	6/87- 5/88 (239)	89.8 (81.5)	0.4 (0.3)	10/85- 7/86 (197)	42.9 (38.9)	0.2 (0.2)
3	9	7/85- 1/87 (391)	44.3 (40.2)	0.1 (0.1)	3/85- 5.86 (304)	68.8 (63.4)	0.2 (0.2)	10/84- 6/85 (179)	43.8 (39.7)	0.2 (0.2)
	10	9/86-11/87 (304)	34.4 (31.2)	0.1 (0.1)	5/86- 4/87 (239)	54.1 (49.0)	0.2 (0.2)	6/85- 1/86 (144)	35.2 (31.9)	0.2 (0.2)
	8	7/87-10/88 (326)	36.9 (33.5)	0.1 (0.1)	4/87- 2/88 (216)	48.9 (44.3)	0.2 (0.2)	1/85- 7/86 (132)	32.3 (29.3)	0.2 (0.2)
	7	6/88- 7/89 (282)	31.9 (29.0)	0.1 (0.1)	2/88- 2/89 (261)	59.0 (53.5)	0.2 (0.2)	7/86- 1/87 (132)	32.3 (29.3)	0.2 (0.2)
4	16	7/85- 9/86 (304)	37.1 (33.6)	0.1 (0.1)	3/85- 1/86 (216)	64.0 (58.0)	0.3 (0.3)	10/84- 3/85 (115)	30.0 (27.2)	0.3 (0.2)
	15	5/86- 9/87 (347)	42.3 (38.4)	0.1 (0.1)	1/86- 1/87 (261)	77.3 (70.1)	0.3 (0.3)	3/85- 9/85 (134)	35.0 (31.7)	0.3 (0.2)
	14	5/87- 8/88 (326)	39.8 (36.1)	0.1 (0.1)	1/87-12/87 (239)	70.8 (64.2)	0.3 (0.3)	9/85- 3/86 (125)	32.6 (29.6)	0.3 (0.2)
	13	4/88- 7/89 (326)	39.8 (36.1)	0.1 (0.1)	12/87-11/88 (239)	70.8 (64.2)	0.3 (0.3)	3/86- 9/86 (125)	32.6 (29.6)	0.3 (0.2)

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Table 4.1.2.2-22. Hydrocarbon emissions and emission rates for Nevada/Utah deployment area — mobile sources.

SEGMENT NO.	GROUP NO.	SHELTER CONSTRUCTION: CONSTRUCTION TIME PERIOD (Number of Working Days)	SHELTER CONSTRUCTION: TOTAL EMISSIONS tons (tonnes)	SHELTER CONSTRUCTION: EMISSION RATE tons/day (tonnes/day)	CLUSTER ROAD CONSTRUCTION: CONSTRUCTION TIME PERIOD (Number of Working Days)	CLUSTER ROAD CONSTRUCTION: TOTAL EMISSIONS tons (tonnes)	CLUSTER ROAD CONSTRUCTION: EMISSION RATE tons/day (tonnes/day)	DTN CONSTRUCTION: CONSTRUCTION TIME PERIOD (Number of Working Days)	DTN CONSTRUCTION: TOTAL EMISSIONS tons (tonnes)	DTN CONSTRUCTION: EMISSION RATE tons/day (tonnes/day)
	11	10/84-11/85 (282)	54.9 (49.8)	0.2 (0.2)	6/84 - 4/85 (216)	81.5 (73.9)	0.4 (0.3)	1/84- 6/84 (105)	36.1 (32.8)	0.3 (0.3)
	4	6/85-11/86 (369)	71.8 (65.2)	0.2 (0.2)	4/85- 4/86 (261)	98.4 (89.3)	0.4 (0.3)	6/84-12/84 (136)	46.8 (42.4)	0.3 (0.3)
1	5	7/86- 8/87 (282)	54.9 (49.8)	0.2 (0.2)	4/86- 1/87 (195)	73.5 (66.7)	0.4 (0.3)	12/84- 4/85 (94)	32.3 (29.3)	0.3 (0.3)
	6	5/87- 6/88 (282)	54.9 (49.8)	0.2 (0.2)	1/87-11/87 (216)	81.5 (73.9)	0.4 (0.3)	4/85-10/85 (115)	39.6 (35.9)	0.3 (0.3)
	12	3/88- 7/89 (347)	67.6 (61.3)	0.2 (0.2)	11/87-11/88 (261)	98.4 (89.3)	0.4 (0.3)	10/85- 4/86 (136)	46.8 (42.4)	0.3 (0.3)
	1	1/85-11/86 (477)	105.0 (95.2)	0.2 (0.2)	10/84- 4/86 (391)	113.9 (103.3)	0.3 (0.3)	5/84- 3/85 (210)	55.8 (50.6)	0.3 (0.2)
2	2	8/86- 2/88 (391)	86.0 (78.0)	0.2 (0.2)	4/86- 6/87 (304)	88.6 (80.3)	0.3 (0.3)	3/85-10/85 (157)	41.7 (34.8)	0.3 (0.2)
	3	10/87- 7/89 (456)	100.3 (91.0)	0.2 (0.2)	6/87- 5/88 (239)	69.6 (63.2)	0.3 (0.3)	10/85- 7/86 (197)	52.3 (47.4)	0.3 (0.2)
	9	7/85- 1/87 (391)	66.8 (60.6)	0.2 (0.2)	3/85- 5/86 (304)	81.3 (73.7)	0.3 (0.2)	10/84- 6/85 (179)	53.4 (48.5)	0.3 (0.3)
	10	9/86-11/87 (304)	51.9 (47.1)	0.2 (0.2)	5/86- 4/87 (239)	63.9 (57.9)	0.3 (0.2)	6/85- 1/86 (144)	43.0 (39.0)	0.3 (0.3)
3	8	7/87-10/88 (326)	55.7 (50.5)	0.2 (0.2)	4/87- 2/88 (216)	57.7 (52.4)	0.3 (0.2)	1/86- 7/86 (132)	39.4 (35.7)	0.3 (0.3)
	7	6/88- 7/89 (282)	48.2 (43.7)	0.2 (0.2)	2/88- 2/89 (261)	69.8 (63.3)	0.3 (0.2)	7/86- 1/87 (132)	39.4 (35.7)	0.3 (0.3)
	16	7/85- 9/86 (304)	55.7 (50.5)	0.2 (0.2)	3/85- 1/86 (216)	75.6 (68.6)	0.4 (0.3)	10/84- 3/85 (115)	36.7 (33.3)	0.3 (0.3)
	15	5/86- 9/87 (347)	63.6 (57.7)	0.2 (0.2)	1/86- 1/87 (261)	91.4 (82.9)	0.4 (0.3)	3/85- 9/85 (134)	42.7 (38.8)	0.3 (0.3)
4	14	5/87- 8/88 (326)	59.8 (54.2)	0.2 (0.2)	1/87-12/87 (239)	83.7 (75.9)	0.4 (0.3)	9/85- 3/86 (125)	39.9 (36.2)	0.3 (0.3)
	13	4/88- 7/89 (326)	59.8 (54.2)	0.2 (0.2)	12/87-11/88 (239)	83.7 (75.9)	0.4 (0.3)	3/86- 9/86 (125)	39.9 (36.2)	0.3 (0.3)

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Table 4.1.2.3-1. Emission factors for diesel-powered industrial equipment.

POLLUTANT	EMISSION FACTOR ($lb/10^3$ GALLONS FUEL)
Carbon monoxide	102.
Exhaust hydrocarbons	37.5
Nitrogen oxides	469.
Aldehydes	7.04
Sulfur oxides	31.2
Particulates	3.5

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Table 4.1.2.3-2. Bituminous surfacing material for DTN construction: generator emissions from sand and gravel processing and stone quarrying and processing plants.

SEGMENT NUMBER	GROUP NUMBER	NUMBER OF CONSTRUCTION DAYS	TOTAL CUBIC YARDS OF BITUMINOUS SURFACING MATERIAL (E + 05)	TOTAL GALLONS OF FUEL[1] (E + 05)	EMISSIONS TOTAL EMISSIONS TONS (TONNES) DAILY EMISSION RATE TONS/DAY (TONNES/DAY)					
					CO	HC	NO_x	ALDEHYDES	SO_x	TSP
1	11	105	1.823	0.406	2.1 (1.9) 0.020 (0.018)	0.8 (0.7) 0.007 (0.007)	9.5 (8.6) 0.091 (0.082)	0.1 (0.1) 0.001 (0.001)	0.6 (0.6) 0.006 (0.005)	0.7 (0.6) 0.006 (0.006)
	4	136	2.378	0.530	2.7 (2.5) 0.020 (0.018)	1.9 (0.9) 0.007 (0.007)	12.4 (11.3) 0.091 (0.083)	0.2 (0.2) 0.001 (0.001)	0.8 (0.8) 0.006 (0.006)	0.9 (0.9) 0.007 (0.006)
	5	94	1.638	0.365	0.9 (1.7) 0.020 (0.018)	0.7 (0.6) 0.007 (0.007)	8.6 (7.8) 0.091 (0.083)	0.1 (0.1) 0.001 (0.001)	0.6 (0.5) 0.006 (0.005)	0.6 (0.6) 0.007 (0.006)
	6	115	2.008	0.447	2.3 (2.1) 0.020 (0.018)	0.8 (0.8) 0.007 (0.007)	10.5 (9.5) 0.091 (0.083)	0.2 (0.1) 0.001 (0.001)	0.7 (0.6) 0.006 (0.006)	0.8 (0.7) 0.007 (0.006)
	12	136	2.378	0.530	2.7 (2.5) 0.020 (0.018)	1.0 (0.9) 0.007 (0.007)	12.4 (11.3) 0.091(0.083)	0.2 (0.2) 0.001 (0.001)	0.8 (0.8) 0.006 (0.006)	0.9 (0.8) 0.007 (0.006)
2	1	210	2.907	0.648	3.3 (3.0) 0.016 (0.014)	1.2 (1.1) 0.006 (0.005)	15.2 (13.8) 0.072 (0.066)	0.2 (0.2) 0.001 (0.001)	1.0 (0.9) 0.005 (0.004)	1.1 (1.0) 0.005 (0.005)
	2	157	2.193	0.489	2.5 (2.3) 0.016 (0.014)	0.9 (0.8) 0.006 (0.005)	11.5 (10.4) 0.073 (0.066)	0.2 (0.2) 0.001 (0.001)	0.8 (0.7) 0.005 (0.004)	0.8 (0.7) 0.005 (0.005)
	3	197	2.748	0.612	3.1 (2.8) 0.016 (0.014)	1.1 (1.0) 0.006 (0.005)	14.4 (13.0) 0.073 (0.066)	0.2 (0.2) 0.001 (0.001)	1.0 (0.9) 0.005 (0.004)	1.0 (0.9) 0.005 (0.005)
3	9	179	2.748	0.612	3.1 (2.8) 0.017 (0.016)	1.1 (1.0) 0.006 (0.006)	14.4 (13.0) 0.080 (0.073)	0.2 (0.2) 0.001 (0.001)	1.0 (0.9) 0.005 (0.005)	1.0 (0.9) 0.006 (0.005)
	10	144	2.193	0.489	2.5 (2.3) 0.017 (0.016)	0.9 (0.8) 0.006 (0.006)	11.5 (10.4) 0.080 (0.072)	0.2 (0.2) 0.001 (0.001)	0.8 (0.7) 0.005 (0.005)	0.8 (0.7) 0.006 (0.005)
	8	132	2.008	0.447	2.3 (2.1) 0.017 (0.016)	0.8 (0.8) 0.006 (0.006)	10.5 (9.5) 0.079 (0.072)	0.2 (0.1) 0.001 (0.001)	0.7 (0.6) 0.005 (0.005)	0.8 (0.7) 0.006 (0.005)
	7	132	2.008	0.447	2.3 (2.1) 0.017 (0.016)	0.8 (0.8) 0.006 (0.006)	10.5 (9.5) 0.079 (0.072)	0.2 (0.1) 0.001 (0.001)	0.7 (0.6) 0.005 (0.005)	0.8 (0.7) 0.006 (0.005)
4	16	115	2.193	0.489	2.5 (2.3) 0.022 (0.020)	0.9 (0.8) 0.008 (0.007)	11.5 (10.4) 0.100 (0.090)	0.2 (0.2) 0.001 (0.001)	0.8 (0.7) 0.007 (0.006)	0.8 (0.7) 0.007 (0.006)
	15	134	2.563	0.571	2.9 (2.6) 0.022 (0.020)	1.1 (1.0) 0.008 (0.007)	13.4 (12.1) 0.100 (0.091)	0.2 (0.2) 0.002 (0.001)	0.9 (0.8) 0.007 (0.006)	1.0 (0.9) 0.007 (0.006)
	14	125	2.378	0.530	2.7 (2.5) 0.022 (0.020)	1.0 (0.9) 0.008 (0.007)	12.4 (11.3) 0.099 (0.090)	0.2 (0.2) 0.001 (0.001)	0.8 (0.8) 0.007 (0.006)	0.9 (0.8) 0.007 (0.006)
	13	125	2.378	0.530	2.7 (2.5) 0.022 (0.020)	1.0 (0.9) 0.008 (0.007)	12.4 (11.3) 0.099 (0.090)	0.2 (0.2) 0.001 (0.001)	0.8 (0.8) 0.007 (0.006)	0.9 (0.8) 0.007 (0.006)

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[1] $\frac{\text{Fuel Rate}}{\text{Material Process Rate}} = \frac{\text{78 Gal.Hr.}}{\text{350 Cy. Hr.}}$ = 0.22; 0.22 x total bituminous surfacing materials (CY) = total gallons fuel needed.

Table 4.1.2.3-3. Bituminous surfacing for DTN construction: generator emissions from asphaltic concrete plants.

SEGMENT NO.	GROUP NO.	NO. OF CONSTRUCTION DAYS	TOTAL CUBIC YARDS OF BITUMINOUS SURFACING MATERIAL (E+05)	TOTAL GALLONS OF FUEL (E+05)	EMISSIONS TOTAL EMISSIONS TONS (TONNES) DAILY EMISSION RATE TONS/DAY (TONNES/DAY)					
					CO	HC	NOx	ALDEHYDES	SOx	TSP
	11	105	1.823	0.560	2.9(2.6)	1.1(1.0)	13.1(11.9)	0.2(0.2)	0.9(0.8)	0.9(0.9)
					0.027(0.025)	0.010(0.009)	0.125(0.113)	0.002(0.002)	0.008(0.008)	0.009(0.008)
	4	136	2.378	0.731	3.7(3.4)	1.4(1.2)	17.1(15.5)	0.3(0.2)	1.1(1.0)	1.2(1.1)
					0.027(0.025)	0.010(0.009)	0.126(0.114)	0.002(0.002)	0.008(0.008)	0.009(0.008)
1	5	94	1.638	0.503	2.6(2.3)	0.9(0.9)	11.8(10.7)	0.2(0.2)	0.8(0.7)	0.8(0.8)
					0.027(0.025)	0.010(0.009)	0.126(0.114)	0.002(0.002)	0.008(0.008)	0.009(0.008)
	6	115	2.008	0.617	3.1(2.9)	1.2(1.0)	14.5(13.1)	0.2(0.2)	1.0(0.9)	1.0(0.9)
					0.027(0.025)	0.010(0.009)	0.126(0.114)	0.002(0.002)	0.008(0.008)	0.009(0.008)
	12	136	2.378	0.731	3.7(3.4)	1.4(1.2)	17.1(15.5)	0.3(0.2)	1.1(1.0)	1.2(1.1)
					0.027(0.025)	0.010(0.009)	0.126(0.114)	0.002(0.002)	0.008(0.008)	0.009(0.008)
	1	210	2.907	0.893	4.6(4.1)	1.7(1.5)	21.0(19.0)	0.3(0.3)	1.4(1.3)	1.5(1.4)
					0.022(0.020)	0.008(0.007)	0.100(0.090)	0.001(0.001)	0.007(0.006)	0.007(0.006)
2	2	157	2.193	0.674	3.4(3.1)	1.3(1.1)	15.8(14.3)	0.2(0.2)	1.1(1.0)	1.1(1.0)
					0.022(0.020)	0.008(0.007)	0.101(0.091)	0.002(0.001)	0.007(0.006)	0.007(0.007)
	3	197	2.748	0.845	4.3(3.9)	1.6(1.4)	19.8(18.0)	0.3(0.3)	1.3(1.2)	1.4(1.3)
					0.022(0.020)	0.008(0.007)	0.101(0.091)	0.002(0.001)	0.007(0.006)	0.007(0.007)
	9	179	2.748	0.845	4.3(3.9)	1.6(1.4)	19.8(18.0)	0.3(0.3)	1.3(1.2)	1.4(1.3)
					0.024(0.022)	0.009(0.008)	0.111(0.100)	0.002(0.002)	0.007(0.007)	0.008(0.007)
	10	144	2.193	0.674	3.4(3.1)	1.3(1.1)	15.8(14.3)	0.2(0.2)	1.1(1.0)	1.1(1.0)
3					0.024(0.022)	0.009(0.008)	0.110(0.100)	0.002(0.001)	0.007(0.007)	0.008(0.007)
	8	132	2.008	0.617	3.1(2.9)	1.2(1.0)	14.5(13.1)	0.2(0.2)	1.0(0.9)	1.0(0.9)
					0.024(0.022)	0.009(0.008)	0.110(0.099)	0.002(0.001)	0.007(0.007)	0.008(0.007)
	7	132	2.008	0.617	3.1(2.9)	1.2(1.0)	14.5(13.1)	0.2(0.2)	1.0(0.9)	1.0(0.9)
					0.024(0.022)	0.009(0.008)	0.110(0.099)	0.002(0.001)	0.007(0.007)	0.008(0.007)
	16	115	2.193	0.674	3.4(3.1)	1.3(1.1)	15.8(14.3)	0.2(0.2)	1.1(1.0)	1.1(1.0)
					0.030(0.027)	0.011(0.010)	0.137(0.125)	0.002(0.002)	0.009(0.008)	0.010(0.009)
	15	134	2.563	0.788	4.0(3.6)	1.5(1.3)	18.5(16.8)	0.3(0.3)	1.2(1.1)	1.3(1.2)
4					0.030(0.027)	0.011(0.010)	0.138(0.125)	0.002(0.002)	0.009(0.008)	0.010(0.009)
	14	125	2.378	0.731	3.7(3.4)	1.4(1.2)	17.1(15.5)	0.3(0.2)	1.1(1.0)	1.2(1.1)
					0.030(0.027)	0.011(0.010)	0.137(0.124)	0.002(0.022)	0.009(0.008)	0.010(0.009)
	13	125	2.378	0.731	3.7(3.4)	1.4(1.2)	17.1(15.5)	0.3(0.2)	1.1(1.0)	1.2(1.1)
					0.030(0.027)	0.011(0.010)	0.137(0.124)	0.002(0.002)	0.009(0.008)	0.010(0.009)

1206

a $\frac{\text{Fuel Rate}}{\text{Material Process Rate}} = \frac{\text{63 Gal Hr}}{\text{205 Cy Hr}}$ = 0.031; 0.31 x total bituminous surfacing (cy) = total gallons fuel needed.

Table 4.1.2.3-4. Aggregate base material for DTN construction: generator emissions from sand and gravel processing plants (Page 1 of 2).

SEGMENT NUMBER	GROUP NUMBER	NUMBER OF CONSTRUCTION DAYS	TOTAL CUBIC YARDS AGGREGATE BASE (E + 05)	TOTAL GALLONS OF FUEL[1] (E + 05)	EMISSIONS TOTAL EMISSIONS TONS (TONNES) DAILY EMISSION RATE TONS/DAY (TONNES/DAY)		
					CO	HC	NO_X
1	11	216	32.90	7.332	37.4 (34.0) 0.174 (1.158)	13.8 (12.4) 0.064 (0.068)	172.0 (156.0) 0.796 (0.722)
	4	261	42.77	9.538	48.6 (44.2) 0.186 (0.170)	17.8 (16.2) 0.068 (0.062)	223.6 (202.8) 0.856 (0.778)
	5	195	29.61	6.598	33.6 (30.6) 0.172 (0.156)	12.4 (11.2) 0.064 (0.058)	154.8 (140.4) 0.795 (0.720)
	6	216	36.19	8.066	41.2 (37.4) 0.190 (0.172)	15.2 (13.8) 0.070 (0.064)	189.2 (171.6) 0.876 (0.794)
	12	261	42.77	9.532	48.6 (44.0) 0.186 (0.168)	17.8 (16.2) 0.068 (0.062)	223.6 (202.8) 0.856 (0.776)
2	1	391	52.64	11.730	59.8 (54.2) 0.154 (0.138)	22.0 (20.0) 0.056 (0.052	275.0 (249.6) 0.704 (0.638)
	2	304	39.48	8.798	44.8 (40.6) 0.148 (0.734)	16.4 (15.0) 0.054 (0.050)	206.4 (187.2) 0.678 (0.616)
	3	239	49.35	11.004	56.2 (51.0) 0.234 (0.212)	20.6 (18.8) 0.086 (0.078)	258.0 (234.0) 1.080 (0.980)
3	9	304	49.35	11.004	56.2 (51.0) 0.184 (0.168)	20.6 (18.8) 0.068 (0.060)	258.0 (234.0) 0.848 (0.770)
	10	239	49.35	11.004	56.2 (51.0) 0.184 (0.168)	20.6 (18.8) 0.068 (0.060)	258.0 (234.0) 0.848 (0.770)
	8	216	39.48	8.798	44.8 (40.6) 0.188 (0.170)	16.4 (15.0) 0.070 (0.062)	206.4 (187.2) 0/0864 (0.782)
	7	261	36.19	8.066	41.2 (37.4) 0.190 (0.172)	15.2 (13.8) 0.070 (0.064)	189.2 (171.6) 0.876 (0.794)
4	16	216	39.48	8.798	44.8 (40.6) 0.208 (0.188)	16.4 (15.0) 0.076 (0.070)	206.4 (187.0) 0.956 (0.866)
	15	261	46.06	8.264	52.4 (47.4) 0.200 (0.182)	19.2 (17.4) 0.074 (0.061)	240.3 (218.4) 0.922 (0.836)
	14	239	42.77	9.532	48.6 (44.0) 0.204 (0.184)	17.8 (16.7) 0.074 (0.068)	223.6 (207.8) 0.936 (0.848)
	13	239	42.77	9.532	48.6 (44.0) 0.204 (0.184)	17.8 (16.2) 0.074 (0.068)	223.6 (202.8) 0.936 (0.848)

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Table 4.1.2.3-4. Aggregate base material for DTN construction: generator emissions from sand and gravel processing plants (page 2 of 2).

SEGMENT NUMBER	GROUP NUMBER	NUMBER OF CONSTRUCTION DAYS	TOTAL CUBIC YARDS AGGREGATE BASE (E + 05)	TOTAL GALLONS OF FUEL[1] (E + 05)	EMISSIONS TOTAL EMISSIONS TONS (TONNES) DAILY EMISSION RATE TONS/DAY (TONNES/DAY)		
					ALDEHYDES	SO_X	TSP
1	11	216	32.90	7.332	2.6 (2.4) 0.012 (0.010)	11.4 (10.4) 0.052 (0.048)	12.2 (11.2) 0.056 (0.052)
	4	261	42.77	9.538	3.4 (3.0) 0.012 (0.012)	14.8 (13.4) 0.058 (0.052)	16.0 (14.4) 0.062 (0.056)
	5	195	29.61	6.598	2.4 (2.2) 0.012 (0.010)	10.2 (9.4) 0.052 (0.048)	11.0 (10.0) 0.056 (0.052)
	6	216	36.19	8.066	2.8 (2.6) 0.014 (0.012)	12.6 (11.4) 0.058 (0.052)	13.6 (12.2) 0.062 (0.056)
	12	261	42.77	9,532	3.4 (3.0) 0.012 (0.012)	14.8 (13.4) 0.056 (0.052)	16.0 (14.4) 0.062 (0.046)
2	1	391	52.64	11.730	4.2 (3.8) 0.010 (0.010)	16.4 (16.6) 0.046 (0.042)	19.6 (17.8) 0.050 (0.046)
	2	304	39.48	8.798	3.0 (2.8) 0.016 (0.014)	13.8 (12.4) 0.072 (0.066)	14.8 (13.4) 0.078 (0.070)
	3	239	49.35	11.004	3.8 (3.6) 0.016 (0.014)	17.2 (15.6) 0.072 (0.066)	18.4 (16.8) 0.078 (0.070)
3	9	304	49.35	11.004	3.8 (3.6) 0.012 (0.012)	13.8 (12.4) 0.056 (0.052)	14.8 (13.4) 0.060 (0.054)
	10	239	39.48	8.798	3.0 (2.8) 0.012 (0.012)	13.8 (12.4) 0.058 (0.052)	14.8 (13.4) 0.061 (0.056)
	8	216	36.19	8.066	1.8 (2.6) 0.014 (0.012)	12.6 (11.4) 0.058 (0.050)	13.6 (12.2) 0.064 (0.056)
	7	261	36.19	8.066	2.8 (2.6) 0.010 (0.010)	12.6 (11.4) 0.048 (0.044)	13.6 (12.2) 0.052 (0.046)
4	16	216	39.48	8.798	30.0 (2.4) 0.014 (0.014)	13.8 (12.4) 0.064 (0.058)	14.8 (13.4) 0.068 (0.062)
	15	261	46.06	8.264	3.6 (3.2) 0.014 (0.012)	16.0 (14.6) 0.062 (0.056)	17.2 (15.6) 0.066 (0.060)
	14	239	42.77	9.532	3.4 (3.0) 0.014 (0.012)	14.8 (13.4) 0.062 (0.056)	16.0 (14.4) 0.066 (0.060)
	13	239	42.77	9.532	3.4 (3.0) 0.014 (0.012)	14.8 (13.4) 0.062 (0.056)	16.0 (15.0) 0.066 (0.060)

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[1] $\frac{\text{Fuel Rate}}{\text{Material Process Rate}} = \frac{\text{78 Ga. Hr.}}{\text{350 Cy. Hr.}} = 0.22$; 0.22 x total aggr egate base (cy) = total gallons fuel needed.

Table 4.1.2.3-5. Aggregate base material for cluster construction: generator emissions from sand and gravel processing and stone quarrying and processing plants (Page 1 of 2).

SEGMENT NUMBER	GROUP NUMBER	NUMBER OF CONSTRUCTION DAYS	TOTAL CUBIC YARDS OF AGGREGATE BASE (E + 05)	TOTAL GALLONS OF FUEL[1] (E + 05)	EMISSIONS TOTAL EMISSIONS TONS (TONNES) DAILY EMISSION RATE TONS/DAY (TONNES/DAY)		
					CO	HC	NO_x
1	11	105	5.658	1.250	6.4 (5.8) 0.062 (0.056)	2.4 (2.1) 0.022 ([illegible])	[illegible] ([illegible]) 0.282 (0.25[illegible])
	4	136	7.380	1.624	8.4 (7.6) 0.062 (0.056)	3.[illegible] (2.[illegible]) 0.022 (0.020)	38.[illegible] ([illegible]) 0.284 (0.25[illegible])
	5	94	5.084	1.118	5.8 (5.2) 0.062 (0.056)	2.2 (2.[illegible]) 0.022 (0.020)	26.[illegible] (24.[illegible]) 0.28[illegible] (0.256)
	6	115	6.232	1.371	7.0 (6.4) 0.062 (0.056)	2.[illegible] (2.4) 0.022 (0.020)	32.[illegible] (29.6) 0.284 (0.256)
	12	136	7.380	1.624	8.4 (5.6) 0.062 (0.056)	3.[illegible] ([illegible]) 0.022 (0.020)	38.[illegible] (35.0) 0.284 (0.258)
2	1	210	9.020	1.984	10.2 (9.2) 0.048 (0.044)	3.8 (3.4) 0.018 (0.016)	47.[illegible] (42.8) 0.224 (0.204)
	2	157	6.806	1.497	7.8 (7.0) 0.050 (0.044)	2.8 ([illegible]) 0.018 (0.016)	35.[illegible] (32.2) 0.226 (0.206)
	3	197	8.528	1.876	9.6 (8.8) 0.050 (0.044)	3.[illegible] (3.2) 0.018 (0.016)	44.6 (40.4) 0.226 (0.206)
3	9	179	8.528	1.876	9.6 (8.8) 0.054 (0.050)	3.6 (3.[illegible]) 0.020 (0.018)	44.[illegible] (40.2) 0.248 (0.226)
	10	144	6.806	1.497	7.8 (7.0) 0.054 (0.0048)	2.8 (2.6) 0.020 (0.018)	35.6 (32.2) 0.248 (0.224)
	8	132	6.232	1.371	7.0 (6.4) 0.054 (0.048)	2.6 (2.4) 0.020 (0.018)	32.6 (29.6) 0.246 (0.224)
	7	132	6.232	1.371	7.0 (6.4) 0.054 (0.048)	2.6 (2.4) 0.020 (0.018)	32.6 (29.6) 0.246 (0.224)
4	16	115	6.806	1.497	7.8 (7.0) 0.06 (0.062)	2.8 (2.6) 0.024 (0.022)	35.6 (32.2) 0.310 (0.280)
	15	134	1.954	1.750	9.0 (8.2) 0.066 (0.060)	3.4 (3.0) 0.024 (0.02[illegible])	46.8 (37.5) 0.304 (0.276)
	14	125	7.380	1.624	8.4 (7.6) 0.068 (0.030)	3.0 (2.8) 0.024 (0.022)	38.6 (35.0) 0.308 (0.280)
	13	125	7.380	1.624	8.4 (7.6) 0.068 (0.060)	3.0 (2.8) 0.024 (0.022)	38.6 (35.0) 0.308 (0.280)

[1] $\frac{\text{Fuel Rate}}{\text{Material Process Rate}} = \frac{78 \text{ Ga. Hr.}}{350 \text{ Cy. Hr.}} = 0.22$; 0.22 x total bituminous surfacing materials [illegible] gallons fuel needed

Table 4.1.2.3-5. Aggregate base material for cluster construction: generator emissions from sand and gravel processing and stone quarrying and processing plants (Page 2 of 2).

SEGMENT NUMBER	GROUP NUMBER	NUMBER OF CONSTRUCTION DAYS	TOTAL CUBIC YARDS OF AGGREGATE BASE (E + 05)	TOTAL GALLONS OF FUEL[1] (E + 05)	EMISSIONS TOTAL EMISSIONS TONS (TONNES) DAILY EMISSION RATE TONS/DAY (TONNES/DAY)		
					ALDEHYDES	SO_x	TSP
1	11	105	5.658	1.250	0.4 (0.4) 0.004 (0.004)	2.0 (0.4) 0.018 (0.018)	2.2 (2.0) 0.020 (0.018)
	4	136	7.380	1.624	0.6 (0.6) 0.004 (0.004)	2.6 (2.4) 0.018 (0.018)	2.8 (2.4) 0.020 (0.018)
	5	94	5.084	1.118	0.4 (0.4) 0.004 (0.004)	1.8 (1.6) 0.018 (0.018)	1.8 (1.8) 0.020 (0.018)
	6	115	6.232	1.371	0.4 (0.4) 0.004 (0.004)	2.2 (2.0) 0.018 (0.018)	2.4 (2.2) 0.020 (0.018)
	12	136	7.380	1.624	0.6 (0.6) 0.004 (0.004)	2.6 (2.4) 0.018 (0.018)	2.8 (2.4) 0.020 (0.018)
2	1	210	9.020	1.984	0.8 (0.6) 0.004 (0.004)	3.2 (2.8) 0.014 (0.014)	3.4 (3.0) 0.016 (0.014)
	2	157	6.806	1.497	0.6 (0.4) 0.006 (0.004)	2.4 (2.2) 0.016 (0.014)	2.6 (2.4) 0.016 (0.014)
	3	197	8.528	1.876	0.6 (0.6) 0.004 (0.004)	3.0 (2.6) 0.016 (0.014)	3.2 (2.8) 0.016 (0.014)
3	9	179	8.528	1.876	0.6 (0.6) 0.006 (0.004)	3.0 (2.6) 0.016 (0.016)	3.2 (2.8) 0.018 (0.016)
	10	144	6.806	1.497	0.6 (0.4) 0.004 (0.004)	2.4 (2.2) 0.016 (0.014)	2.6 (2.4) 0.018 (0.016)
	8	132	6.232	1.371	0.4 (0.4) 0.004 (0.004)	2.2 (2.0) 0.016 (0.014)	2.4 (2.2) 0.018 (0.016)
	7	132	6.232	1.371	0.4 (0.4) 0.004 (0.004)	2.2 (2.0) 0.016 (0.014)	2.4 (2.2) 0.018 (0.016)
4	16	115	6.806	1.497	0.6 (0.4) 0.004 (0.004)	2.4 (2.2) 0.020 (0.018)	2.6 (2.4) 0.022 (0.020)
	15	134	1.954	1.750	0.6 (0.6) 0.004 (0.004)	2.8 (2.6) 0.020 (0.018	3.0 (2.6) 0.022 (0.020)
	14	125	7.380	1.624	0.6 (0.6) 0.004 (0.004)	2.6 (2.4) 0.020 (0.018)	2.8 (2.4) 0.022 (0.020)
	13	125	7.380	1.624	0.6 (0.6) 0.004 (0.004)	2.6 (2.4) 0.020 (0.006)	2.8 (2.4) 0.022 (0.020)

1208-1

[1] $\frac{\text{Fuel Rate}}{\text{Material Process Rate}} = \frac{\text{78 Ga. Hr.}}{\text{350 Cy. Hr.}} =$ 0.22; 0.22 x total bituminous surfacing materials (CY) = total gallons fuel needed.

Table 4.1.2.3-6. Concrete for shelter construction: generator emissions from concrete batching plants.

SEGMENT NUMBER	GROUP NUMBER	NUMBER OF CONSTRUCTION DAYS	TOTAL CUBIC YARDS OF CONCRETE (E + .05)	TOTAL GALLONS OF FUEL[1] (E + .05)	EMISSIONS TOTAL EMISSIONS TONS (TONNES) DAILY EMISSION RATE TONS/DAY (TONNES/DAY)					
					CO	HC	NO_x	ALDEHYDES	SO_x	TSP
1	11	282	2.990	0.140	0.7(0.6) 0.003(0.002)	0.3(0.2) 0.001(0.001)	3.3(3.0) 0.012(0.011)	0.1(0.0) 0.000(0.000)	0.2(0.2) 0.001(0.001)	0.2(0.2) 0.001(0.001)
	4	369	3.887	0.181	0.9(0.8) 0.003(0.002)	0.3(0.3) 0.001(0.001)	4.3(3.9) 0.012(0.010)	0.1(0.1) 0.000(0.000)	0.3(0.3) 0.001(0.001)	0.3(0.3) 0.001(0.001)
	5	282	2.691	0.126	0.6(0.6) 0.002(0.002)	0.2(0.2) 0.001(0.001)	2.9(2.7) 0.010(0.009)	0.0(0.0) 0.000(0.000)	0.2(0.2) 0.001(0.001)	0.2(0.2) 0.001(0.001)
	6	282	3.289	0.153	0.8(0.7) 0.003(0.003)	0.3(0.3) 0.001(0.001)	3.6(3.3) 0.013(0.012)	0.1(0.0) 0.000(0.000)	0.2(0.2) 0.001(0.001)	0.3(0.2) 0.001(0.001)
	12	347	3.887	0.181	0.9(0.8) 0.003(0.002)	0.3(0.3) 0.001(0.001)	4.3(3.9) 0.012(0.011)	0.1(0.1) 0.000(0.000)	0.3(0.3) 0.001(0.001)	0.3(0.3) 0.001(0.001)
2	1	477	4.784	0.223	1.1(1.0) 0.002(0.002)	0.4(0.4) 0.001(0.001)	5.2(4.7) 0.011(0.010)	0.1(0.1) 0.000(0.000)	0.3(0.3) 0.001(0.001)	0.4(0.3) 0.001(0.001)
	2	391	3.588	0.167	0.9(0.8) 0.002(0.002)	0.3(0.3) 0.001(0.001)	3.9(3.6) 0.010(0.009)	0.1(0.1) 0.000(0.000)	0.3(0.2) 0.001(0.001)	0.3(0.3) 0.001(0.001)
	3	456	4.485	0.209	1.1(1.0) 0.002(0.002)	0.4(0.4) 0.001(0.001)	4.9(4.5) 0.011(0.010)	0.1(0.1) 0.000(0.000)	0.3(0.3) 0.001(0.001)	0.4(0.3) 0.001(0.001)
3	9	391	4.485	0.209	1.1(1.0) 0.003(0.002)	0.4(0.4) 0.001(0.001)	4.9(4.5) 0.013(0.011)	0.1(0.1) 0.000(0.000)	0.3(0.3) 0.001(0.001)	0.4(0.3) 0.001(0.001)
	10	304	3.588	0.167	0.0(0.8) 0.003(0.003)	0.3(0.3) 0.001(0.001)	3.9(3.6) 0.013(0.012)	0.1(0.1) 0.000(0.000)	0.3(0.2) 0.001(0.001)	0.3(0.3) 0.001(0.001)
	8	326	3.289	0.153	0.8(0.7) 0.002(0.002)	0.3(0.3) 0.001(0.001)	3.6(3.3) 0.011(0.010)	0.1(0.0) 0.000(0.000)	0.2(0.2) 0.001(0.001)	0.3(0.2) 0.001(0.001)
	7	282	3.289	0.153	0.8(0.7) 0.003(0.003)	0.3(0.3) 0.001(0.001)	3.6(3.3) 0.013(0.012)	0.1(0.0) 0.000(0.000)	0.2(0.2) 0.001(0.001)	0.3(0.2) 0.001(0.001)
4	16	304	3.588	0.167	0.9(0.8) 0.003(0.003)	0.3(0.3) 0.001(0.001)	3.9(3.6) 0.013(0.012)	0.1(0.1) 0.000(0.000)	0.3(0.2) 0.001(0.001)	0.3(0.3) 0.001(0.001)
	15	347	4.186	0.195	1.0(0.9) 0.003(0.003)	0.4(0.3) 0.001(0.001)	4.6(4.2) 0.013(0.012)	0.1(0.1) 0.000(0.000)	0.3(0.3) 0.001(0.001)	0.3(0.3) 0.001(0.001)
	14	326	3.887	0.181	0.9(0.8) 0.003(0.003)	0.3(0.3) 0.001(0.001)	4.3(3.9) 0.013(0.012)	0.1(0.1) 0.000(0.000)	0.3(0.3) 0.001(0.001)	0.3(0.3) 0.001(0.001)
	13	326	3.887	0.181	0.9(0.8) 0.003(0.003)	0.3(0.3) 0.001(0.001)	4.3(3.9) 0.013(0.012)	0.1(0.1) 0.000(0.000)	0.3(0.3) 0.001(0.001)	0.3(0.3) 0.001(0.001)

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[1] $\frac{\text{Fuel Rate}}{\text{Material Process Rate}} = \frac{\text{7 Gal./HR.}}{\text{150 CY/HR.}} = 0.05$; 0.05 X Total Concrete (CY) = Total Gallons Fuel Needed

Table 4.1.2.3-7. Concrete for shelter construction — generator emissions — sand and gravel processing and stone quarrying and processing plants.

SEGMENT NUMBER	GROUP NUMBER	NUMBER OF CONSTRUCTION DAYS	TOTAL CUBIC YARDS OF CONCRETE (E + 05)	TOTAL[1] (E + 05)	EMISSIONS TOTAL EMISSIONS TONS (TONNES) DAILY EMISSION RATE TONS/DAY (TONNES/DAY)					
					CO	HC	NO_x	ALDEHYDES	SO_x	TSP
1	11	282	2.990	0.666	3.4 (3.1) 0.012 (0.011)	1.2 (1.1) 0.004 (0.004)	15.6 (14.2) 0.055 (0.050)	0.2 (0.2) 0.001 (0.001)	1.0 (0.9) 0.004 (0.003)	1.1 (1.0) 0.004 (0.004)
	4	369	3.887	0.866	4.4 (4.0) 0.012 (0.011)	1.6 (1.5) 0.004 (0.004)	20.3 (18.4) 0.055 (0.050)	0.3 (0.3) 0.001 (0.001)	1.4 (1.2) 0.004 (0.003)	1.5 (1.3) 0.004 (0.004)
	5	282	2.691	0.600	3.1 (2.8) 0.011 (0.010)	1.1 (1.0) 0.004 (0.004)	14.1 (12.8) 0.050 (0.045)	0.2 (0.2) 0.001 (0.001)	0.9 (0.8) 0.003 (0.003)	1.9 (0.9) 0.004 (0.003)
	6	282	3.289	0.733	3.7 (3.4) 0.013 (0.012)	1.4 (1.2) 0.005 (0.004)	17.2 (15.6) 0.061 (0.055)	0.3 (0.2) 0.001 (0.001)	1.1 (1.0) 0.004 (0.004)	1.2 (1.1) 0.004 (0.004)
	12	347	3.887	0.866	4.4 (4.0) 0.013 (0.012)	1.6 (1.5) 0.005 (0.004)	20.3 (18.4) 0.059 (0.053)	0.3 (0.3) 0.001 (0.001)	1.4 (1.2) 0.004 (0.004)	1.5 (1.3) 0.004 (0.004)
2	1	477	4.784	1.066	5.4 (4.9) 0.011 (0.010)	2.0 (1.8) 0.004 (0.004)	25.0 (22.7) 0.052 (0.048)	0.4 (0.3) 0.001 (0.001)	1.7 (1.5) 0.003 (0.003)	1.8 (1.6) 0.004 (0.003)
	2	391	3.588	0.800	4.1 (3.7) 0.010 (0.009)	1.5 (1.4) 0.004 (0.003)	18.8 (17.0) 0.048 (0.043)	0.3 (0.3) 0.001 (0.001)	1.2 (1.1) 0.003 (0.003)	1.3 (1.2) 0.003 (0.003)
	3	456	4.485	1.000	5.1 (4.6) 0.011 (0.010)	1.9 (1.7) 0.004 (0.004)	23.4 (21.3) 0.051 (0.047)	0.4 (0.3) 0.001 (0.001)	1.6 (1.4) 0.003 (0.003)	1.7 (1.5) 0.004 (0.003)
3	9	391	4.485	1.000	5.1 (4.6) 0.013 (0.012)	1.9 (1.7) 0.005 (0.004)	23.4 (21.3) 0.060 (0.054)	0.4 (0.3) 0.001 (0.001)	1.6 (1.4) 0.004 (0.004)	1.7 (1.5) 0.004 (0.004)
	10	304	3.588	0.800	4.1 (3.7) 0.013 (0.012)	1.5 (1.4) 0.005 (0.004)	18.8 (17.0) 0.062 (0.056)	0.3 (0.3) 0.001 (0.001)	1.2 (1.1) 0.004 (0.004)	1.3 (1.2) 0.004 (0.004)
	8	326	3.289	0.733	3.7 (3.4) 0.011 (0.010)	1.4 (1.2) 0.004 (0.004)	17.2 (15.6) 0.053 (0.048)	0.3 (0.2) 0.011 (0.001)	1.1 (1.0) 0.004 (0.003)	1.2 (1.1) 0.004 (0.003)
	7	282	3.289	0.733	3.7 (3.4) 0.013 (0.012)	1.4 (1.2) 0.005 (0.004)	17.2 (15.6) 0.061 (0.055)	0.3 (0.2) 0.001 (0.001)	1.1 (1.0) 0.004 (0.004)	1.2 (1.1) 0.004 (0.004)
4	16	304	3.588	0.800	4.1 (3.7) 0.013 (0.012)	1.5 (1.4) 0.005 (0.004)	18.8 (17.0) 0.062 (0.056)	0.3 (0.3) 0.001 (0.001)	1.2 (1.1) 0.004 (0.004)	1.3 (1.2) 0.004 (0.004)
	15	347	4.186	0.933	4.8 (4.3) 0.014 (0.012)	1.7 (1.6) 0.005 (0.005)	21.9 (19.8) 0.063 (0.057)	0.3 (0.3) 0.001 (0.001)	1.5 (1.3) 0.004 (0.004)	1.6 (1.4) 0.005 (0.004)
	14	326	3.887	0.866	4.4 (4.0) 0.014 (0.012)	1.6 (1.5) 0.005 (0.005)	20.3 (18.4) 0.062 (0.057)	0.3 (0.3) 0.001 (0.001)	1.4 (1.2) 0.004 (0.004)	1.5 (1.3) 0.004 (0.004)
	13	326	3.887	0.866	4.4 (4.0) 0.014 (0.012)	1.6 (1.5) 0.005 (0.005)	20.3 (18.4) 0.062 (0.057)	0.3 (0.3) 0.001 (0.001)	1.4 (1.2) 0.004 (0.004)	1.5 (1.3) 0.004 (0.004)

121.

[1] $\frac{\text{Fuel Rate}}{\text{Material Process Rate}} = \frac{78 \text{ Gal./Hr.}}{350 \text{ Cy/Hr.}} = 0.22$; 0.22 x total concrete (cy) = total gallons of fuel.

Table 4.1.3-1. National average vehicle mix.

VEHICLE TYPE	PERCENT
Motorcycles	0
Cars	80
Light-duty trucks	12
Heavy-duty trucks or buses (gas)	5
Heavy-duty trucks or buses (diesel)	3

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Table 4.1.3-2. Emission factors used for vehicles associated with the operating base.

VEHICLE TYPE	CO (gm/mi)	HC[a] (gm/mi)	NO_x (gm/mi)	SO_x (gm/mi)	TSP[b] (gm/mi)
Automobile	45.0	3.3 1.76 5.06	3.2	0.13	0.54
Light-duty truck	76.3	6.2 2.15 8.35	3.6	0.18	0.54
Heavy-duty (gas)	288.1	28.0 2.0 30.0	10.5	0.36	$0.91 + 0.2(\frac{w}{4})$
Heavy-duty (diesel)	27.0	4.5 N/A 4.5	20.1	2.8	$1.3 - 0.2(\frac{w}{4})$

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[a]Total hydrocarbon emission factor is sum of exhaust emission factor and crankcase/evaporative emission factor.

[b]Includes both exhaust and tire wear. An adjustment is made for trucks with more than 4 wheels. W equals number of wheels.

1982 calendar year using 1975 vehicles. Standard Test conditions.

Source: "Mobile Source Emission Factors," EPA. March, 1978.

For modeling purposes, the emissions from a "composite" vehicle determined by the national average vehicle mix were calculated as below:

CO; $(0.8 \times 45) + (0.12 \times 76.3) + (0.05 \times 288.1) + (0.03 \times 27) = 60.4$ g/mi

HC; $(0.8 \times 5.06) + (0.12 \times 8.35) + (0.05 \times 30.0) + (0.03 \times 4.5) = 7.2$ g/mi

NO_x; $(0.8 \times 3.2) + (0.12 \times 3.6) + (0.05 \times 10.5) + (0.03 \times 20.1) = 4.12$ g/mi

SO_x; $(0.8 \times 0.13) + (0.12 \times 0.18) + (0.05 \times 0.36) + (0.03 \times 2.8) = 0.23$ g/mi

TSP; $(0.8 \times 0.54) + (0.12 \times 0.54) + 0.05 \quad 0.91 + 0.2(\frac{6}{4}) + 0.03 \quad 1.3 + 0.2(\frac{18}{4})$
$= 0.62$ g/mi

Table 4.1.3-3 is a summary of pollutant emission rates reported on the basis of vehicle volume per hour. These rates were used along with various meteorological assumptions as input parameters for PAL modeling. Results of the modeling are reported in Section 5 of this report.

Assumptions Used for PAL Modeling

Wind speed, stability class, and mixing height:

1. 1 m/sec, F stability, 50 m mixing ht.
2. 5 m/sec, E stability, 250 m mixing ht.
3. 5 m/sec, D stability, 500 m mixing ht.
4. 5 m/sec, C stability, 5,000 m mixing ht.

Wind direction to road segment:

1. 0°
2. 45°
3. 90°

4.2 METEOROLOGICAL DATA

MODEL INPUT REQUIREMENTS (4.2.1)

In order to numerically simulate the atmospheric transport of M-X-related emissions, it was necessary to provide meteorological data pertinent to the location of interest and to the dispersion model used. The IMPACT model requires as a minimum level of input wind speeds and directions at one location in the model grid for each hour of the simulation. Additionally, an atmospheric stability class vertical profile is necessary for at least one location in the grid consisting of a Pas[illegible] stability class assigned to each model layer in the vertical. This data deter[illegible] the amount of vertical dispersion that occurs as well as the vertical ex[illegible] mixing.

The preferred form of input to IMPACT consists of wind profiles [illegible] the highest layer specified in the model simulation. However, winds sp[illegible] level are sufficient to drive the model calculations as the model [illegible] upper level winds from surface winds by considering the stabili[illegible] extremely beneficial in areas of complex terrain to have input w[illegible] more than one location. If a single location for input winds is [illegible]

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M-X ENVIRONMENTAL TECHNICAL REPORT. ENVIRONMENTAL CHARACTERISTI--ETC(U)
DEC 80 F04704-78-C-0029
UNCLASSIFIED M-X-ETR-13 AFSC-TR-81-28 NL

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Table 4.1.3-3. Emission rates based on vehicle volume per hour (gm/sec-m).

VOLUME		CO	HC	NO_x	SO_x	TSP
1.	100	0.001	0.0001	$0.7x10^{-4}$	$4.0x10^{-6}$	$1.1x10^{-5}$
2.	500	0.005	0.0006	$0.3x10^{-3}$	$2.0x10^{-5}$	$5.4x10^{-5}$
3.	1.000	0.010	0.0012	$0.7x10^{-3}$	$4.0x10^{-5}$	$1.1x10^{-4}$
4.	1,500	0.016	0.0019	$1.1x10^{-3}$	$6.0x10^{-5}$	$1.6x10^{-4}$
5.	2,000	0.021	0.0025	$1.4x10^{-3}$	$7.9x10^{-5}$	$2.1x10^{-4}$
6.	2,500	0.026	0.0031	$1.8x10^{-3}$	$9.9x10^{-5}$	$2.7x10^{-4}$
7.	5,000	0.052	0.0062	$3.6x10^{-3}$	$2.0x10^{-4}$	$5.4x10^{-4}$
8.	7,500	.078	0.0093	$5.4x10^{-3}$	$2.99x10^{-4}$	$8.1x10^{-4}$

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grid cells in the model will contain winds characteristics of that one location, although modified somewhat by the terrain. To capture thermal effects on local flows, mesoscale circulation patterns, and topographic influences, such as channeling of the wind, it is necessary to have input winds at several locations in the region of interest.

The meteoroligcal input requirements for the HIWAY and PAL models are different than that required for IMPACT. Both HIWAY and PAL models are steady-state Gaussian models so the wind data are only needed at one location and are considered to be constant both vertically and horizontally throughout the area for which concentrations are being calculated. In addition to wind speed and direction data for each hour, atmospheric stability class and mixing height data are needed as input. The stability class is used in the calculation of the vertical dispersion coefficient while the mixing height represents an upper limit to the extent which pollutants can be vertically mixed. In these models, the stabilility class is assumed to be constant from the surface to the mixing height. Generally, the ground surface stability class is used as input to the model.

METEOROLOGICAL SCENARIOS FOR IMPACT (4.2.2)

Site-specific meteorological data were not available for the various operating base (OB) and deployment area (DA) valleys to which IMPACT was applied. As an alternative to actual data, various meteorological scenarios were used as input to the model calculations. These meteorological scenarios represented wind and stability regimes typical of those which occur in the individual locations. Meteorological conditions were chosen that would tend to result in high concentrations, although not necessarily in worst-case concentrations.

Climatological wind data from the Nevada Test Site and Nuclear Rocket Development Station were used for guidance in the selection of the Dry Lake-Delamar Valley meteorology. The test site data represented wind regimes typical of a basin and range system. These data contained the monthly and hourly climatology of wind speeds and direction both on a valley floor and on nearby mountaintops and slopes.

For Dry Lake-Delamar Valley five locations for input winds were selected (Figure 4.2.2-1). Four of these locations were on elevated terrain and one on the valley floor. The winds selected for these five points represent a situation similar to a low wind speed day in April at the Nevada Test Site. Five locations for input winds were chosen in an attempt to account for the early morning upslope wind that occurs as a result of heating on the western slopes. The initial winds at 8:00 a.m. are extremely light and slightly up the mountains on the west site of the valley to represent the thermal effects present early in the morning. By mid-morning, the winds have shifted to an up-valley flow from the south which peaks during the mid-afternoon. Winds at upper elevations are of a somewhat greater wind speed as was indicated to be the usual situation in the Nevada Test Site data. The up-valley wind case is potentially the worst condition for high pollutant concentrations because it maximizes the cumulative effects of all of the upwind emission sources on downwind receptors due to orientation of the M-X system along the valley floor. Atmospheric stability is assumed to change from stable to slightly unstable at the surface after solar heating of the valley floor occurs in the morning. The stability returns to neutral in the afternoon as wind spe ds increase and the atmosphere is well mixed.

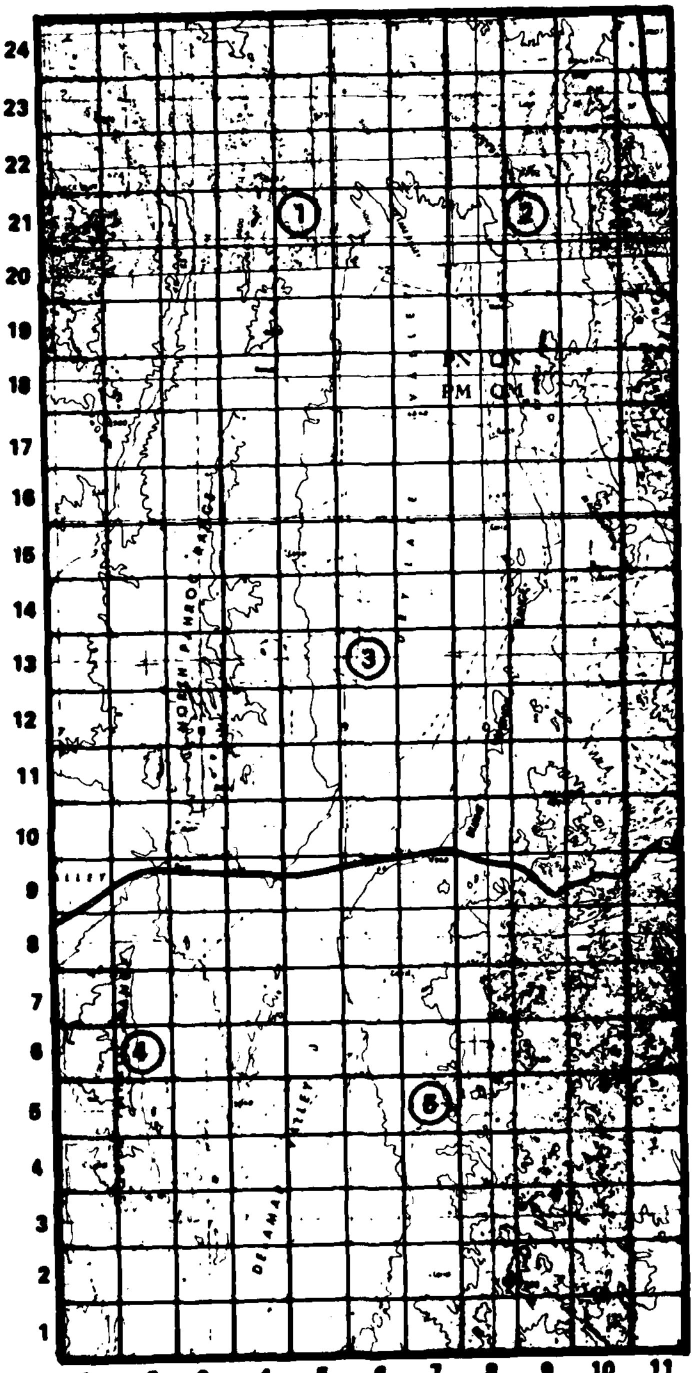

Figure 4.2.2-1. Locations of meteorological input data for the IMPACT model in Dry Lake-Delamar Valleys.

Above 500 m, the atmosphere is assumed to remain neutral throughout the simulation (see Table 4.2.2-1).

The meteorological conditions input for Steptoe Valley simulation are similar to those for Dry Lake-Delamar with the exception of wind direction (Table 4.2.2-2). The prevailing wind direction in Steptoe Valley is from the south which would transport the potential operating base emissions towards the town of Ely. The simulations at Beryl, Coyote Spring, and Delta represented morning conditions, with light winds blowing from the southwest (Tables 4.2.2-3, 4.2.2-4, and 4.2.2-5). The model run made for Duckwater consisted of a flow reversal case. This consists of light winds from the north at 8:00 a.m. and 9:00 a.m. changing to light southerly winds at 10:00 a.m. (Table 4.2.2-6). These conditions occur frequently in a mountain-valley system and can produce high pollutant concentrations by transporting previously emitted pollutants back over the source area.

The meteorological conditions assumed for the Texas/New Mexico model runs (Clovis, Hereford, Dalhart) were basically similar to each other (Tables 4.2.2-7 and 4.2.2-8). The prevailing winds were assumed to be from the west-southwest, which is typical of this region. Early morning conditions were assumed to be a stable atmosphere with light wind speeds of 4 to 5 mi per hour. [illegible], late morning or early afternoon, winds had increased to 12 to 15 mi per hour and the atmospheric conditions were neutral.

METEOROLOGICAL INPUT TO PAL AND HIWAY (4.2.3)

The EPA Gaussian models PAL and HIWAY were used to calculate localized maximum concentrations during construction activities and at the potential operating base (OB) locations. PAL was used to estimate particulate concentrations due to shelter construction emissions. Meteorological input consisted of worst case mixing height, wind speed, and stability class values observed for a one-day period and a five-day period at Ely, Nevada (Holzworth, 1974). Wind direction was assumed to be that which produced maximum downwind concentrations.

PAL was also used to model the air pollution concentrations of OB construction. Theoretical mixing height, wind speed, and stability classes producing poor dilution were used. The conditions used were a wind speed of 5 meters per second, a 500 meter mixing height, and a stable atmosphere and are similar to the worst five-day conditions reported for Amarillo, Texas. Because of limitations of the PAL model as discussed earlier in Section 3.4, and in the emissions data for the OB construction, it was not considered necessary to use more refined meteorological data. The PAL results are presented only to give a rough approximation of particulate problems to be expected near to construction activity.

The HIWAY model was used to model very localized concentrations associated with peak hour traffic during OB operation. Hypothetical worst case meteorological conditions of a 1 meter per second wind parallel to the roadway, 25 meter mixing height, and a very stable atmosphere was assumed. These conditions were used to predict the worst-case concentrations.

Table 4.2.2-1. IMPACT modeled meteorological conditions for Delamar/Dry Lake Valley (Valleys 181 and 182).

HOUR	STATION	WIND SPEED (M/SEC)	WIND DIRECTION (DEG)	PASQUILL STABILITY CLASS
0600 (Before start of construction)	1	0.4	315	E-D (Lower level inversion)
	2	0.4	80	
	3	1.3	0	
	4	0.9	270	
	5	0.9	120	
0800 (Start of construction)	1	1.3	90	E-D (Lower level inversion)
	2	0.9	100	
	3	0.9	0	
	4	1.3	90	
	5	1.3	130	
1000	1	3.1	170	D (Neutral to mixing height)
	2	2.7	220	
	3	1.8	180	
	4	3.1	180	
	5	2.7	230	
1300	1	4.5	210	C-D (Class C for ground layer)
	2	5.4	190	
	3	3.6	200	
	4	4.9	200	
	5	5.8	190	
1700 (After construction)	1	4.5	240	D (Neutral to mixing height
	2	5.4	230	
	3	4.5	180	
	4	4.9	170	
	5	4.9	210	

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Table 4.2.2-2. IMPACT model meteorological conditions for Ely, Nevada, OB site.

STATION	GRID COORD.		HOUR	WIND SPEED (M/SEC)	WIND DIRECTION (DEG)	PASQUILL STABILITY CLASS
	I	J				
1	7	21	6:00 a.m.	1.3	180	E
2	9	12	6:00 a.m.	0.9	100	E
3	11	3	6:00 a.m.	1.3	130	E
1	7	21	7:00 a.m.	1.8	190	E
2	9	12	7:00 a.m.	2.2	130	E
3	11	3	7:00 a.m.	1.8	190	E
1	7	21	8.00 a.m.	1.8	170	E
2	9	12	8:00 a.m.	2.7	180	E
3	11	3	8:00 a.m.	2.7	200	E
1	7	21	9:00 a.m.	2.2	150	D
2	9	12	9:00 a.m.	2.7	200	D
3	11	3	9:00 a.m.	3.6	210	D
1	7	21	10:00 a.m.	3.1	180	D
2	9	12	10:00 a.m.	3.6	170	D
3	11	3	10:00 a.m.	2.7	190	D
1	7	21	11:00 a.m.	3.6	170	D
2	9	12	11:00 a.m.	3.6	190	D
3	11	3	11:00 a.m.	3.6	180	D
1	7	21	12:00 p.m.	3.6	160	D
2	9	12	12:00 p.m.	3.6	170	D
3	11	3	12:00 p.m.	4.5	190	D
1	7	21	1:00 p.m.	4.5	170	D
2	9	12	1:00 p.m.	4.9	150	D
3	11	3	1:00 p.m.	4.5	200	D

2111

Table 4.2.2-3. IMPACT model meteorological conditions for the Beryl, Utah region.

TIME	GRID LOCATION		WIND SPEED (meters/sec)[2]	WIND DIRECTION (degrees from north)[1]	STABILITY CLASS[2]
	I	J[2]			
8:00 a.m.	2	8	1.3	230	E
	4	2	1.8	290	E
	18	6	1.3	270	E
9:00 a.m.	2	8	1.8	240	E
	4	2	0.9	270	E
	18	6	0.9	250	E
10:00 a.m.	2	8	4.9	230	D
	4	2	4.9	190	D
	18	6	4.0	270	D
11:00 a.m.	2	8	5.8	260	D
	4	2	5.4	210	D
	18	6	3.6	280	D

2110-1

[1]Cell identifier I is the horizontal axis and J is the vertical axis (0.0) is at the bottom left-hand (southwestern) corner of the grid.

[2]At all layers.

Table 4.2.2-4. IMPACT model meteorological conditions for Coyote Spring, Nevada OB site.

STATION	TIME	GRID COORDINATES		WIND SPEED (m/sec)	WIND DIRECTION (DEG)	PASQUILL STABILITY CLASS
		I	J			
1	0800	4	6	1.3	180	E
2	0800	13	3	0.9	120	
1	0900	4	6	1.3	160	E
2	0900	13	3	1.3	110	
1	1000	4	6	4.0	170	D-E
2	1000	13	3	3.6	160	
1	1100	4	6	4.5	180	D
2	1100	13	3	4.0	170	

2301-1

Table 4.2.2-5. IMPACT model meteorological conditions for Delta area (Valley 46).

HOUR	STATION	WIND SPEED (M/SEC)	WIND DIRECTION (DEG)	PASQUILL STABILITY CLASS
0800	1	2.2	315	E-D
	2	2.7	225	(Lower level inversion)
	3	2.2	270	
0900	1	2.7	300	E-D
	2	2.7	235	(Lower level inversion)
	3	2.7	270	
1000	1	5.4	290	D-E-D
	2	4.9	250	(Inversion breading up)
	3	4.5	270	
1100	1	5.8	290	D
	2	5.4	260	(Neutral to mixing height)
	3	5.4	270	

2195-1

Table 4.2.2-6. IMPACT model meteorological conditions for Duckwater area (Valley 173B).

HOUR	STATION	WIND SPEED (M/SEC)	WIND DIRECTION (DEG)	PASQUILL STABILITY CLASS
0800	1	1.3	360	E-D (Lower level inversion)
	2	1.8	20	
0900	1	1.8	350	E-D (Lower level inversion)
	2	1.3	360	
1000	1	4.5	170	D-E-D (Inversion breaking up)
	2	5.4	160	
100	1	5.4	180	D (Neutral to mixing height)
	2	5.8	170	

2196-1

Table 4.2.2-7. IMPACT model meteorological conditions for Dalhart, Texas, and Clovis, New Mexico areas.

HOUR	STATION	GRID COORDINATE		WIND SPEED	WIND DIRECTION	PASQUILL STABILITY CLASS
		I	J	(m/sec)	(degree)	
0800	1	5	5	1.8	240	E
0900	1	5	5	2.7	255	E
1000	1	5	5	5.8	260	D-E
1100	1	5	5	6.3	250	D

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Table 4.2.2-8. IMPACT model meteorological conditions for Hereford, Texas area.

HOUR	STATION	GRID COORDINATE		WIND SPEED	WIND DIRECTION	PASQUILL STABILITY CLASS
		I	J	(m/sec)	(degree)	
0800	1	5	5	1.8	240	E
0900	1	5	5	2.2	255	E
1000	1	5	5	5.8	260	D-E
1100	1	5	5	6.3	250	D

2284

5.0 MODELING RESULTS

As mentioned in Section 4.1.1, the air quality modeling was performed based upon preliminary system designs. Further, methodological data for the area are very limited. In spite of data limitations, it was felt that the magnitude of the air quality impacts could be gauged through a general application of the EPA approved HIWAY and PAL models, supplemented by simulations provided by the IMPACT complex terrain computer model. The results presented here should be viewed as preliminary, and will be refined as more specific data become available.

5.1 IMPACT

EMISSION GRIDS (5.1.1)

The IMPACT model requires an emission value for each grid cell. The area to be modeled is divided by a grid consisting of square grid cells of a predetermined size. Size of the grid squares is determined by the user according to the degree of geographic resolution warranted by the particular conditions modeled. The IMPACT model was applied to predict regional scale impacts. Grid cells 4 km square were deemed appropriate for modeling construction activity in the deployment area, whereas, grid cells 4,000 feet by 4,000 feet were used in modeling the concentrations of gaseous pollutants around the OB sites during system operation.

The areas selected for construction modeling were Dry Lake/Delamar valleys in Nevada; Duckwater Valley, Nevada; Delta, Utah; Dalhart, Texas; Clovis, Texas; and Hereford, New Mexico (Figures 5.1.1-1 through 5.1.1-7). The Dry Lake/Delamar area was modeled using two types of potential system layouts. The first layout presented (Figure 5.1.1-1) is an older configuration referred to as the loop system and is left in this report for comparison to the newer layout referred to as linear (Figure 5.1.1-2). Much of the early air quality modeling groundwork was completed using the loop system configuration; i.e., emissions were originally calculated for loop systems in terms of both mitigated and unmitigated rates whereas emissions for all linear system grids use mitigated rates only (see Sections 4.1.2.1 and 5.1.3).

The emission grids used for the OB sites of Ely, Nevada; Beryl, Utah; Coyote Springs, Nevada; and Clovis, Texas are shown in Figure 5.1.1-8 through 5.1.1-15. The emission values assigned to the grid cell are given in grams per second and placed directly on these figures. A CO and NO_x emission grid is given for each OB site.

DIGITIZED TERRAIN (5.1.2)

The IMPACT model is capable of handling wind flow around features of complex terrain and simulating a wide variety of meteorologic conditions characteristic of the landscape in question. To implement this capacity of the model it is necessary to input an averaged value of terrain height for each of the grid cells used to define the modeling area. The grid cells correspond to the emission grids shown in Figures 5.1.1-1 through 5.1.1-15 in the previous section. Average terrain height values were obtained for each of these cells by overlaying the grid on a topographic map of the area and digitizing contour lines. Computer output representations of the input values are shown in Figures 5.1.2-1 through 5.1.2-10. The numbers on the figures correspond to a height value range given by the legend.

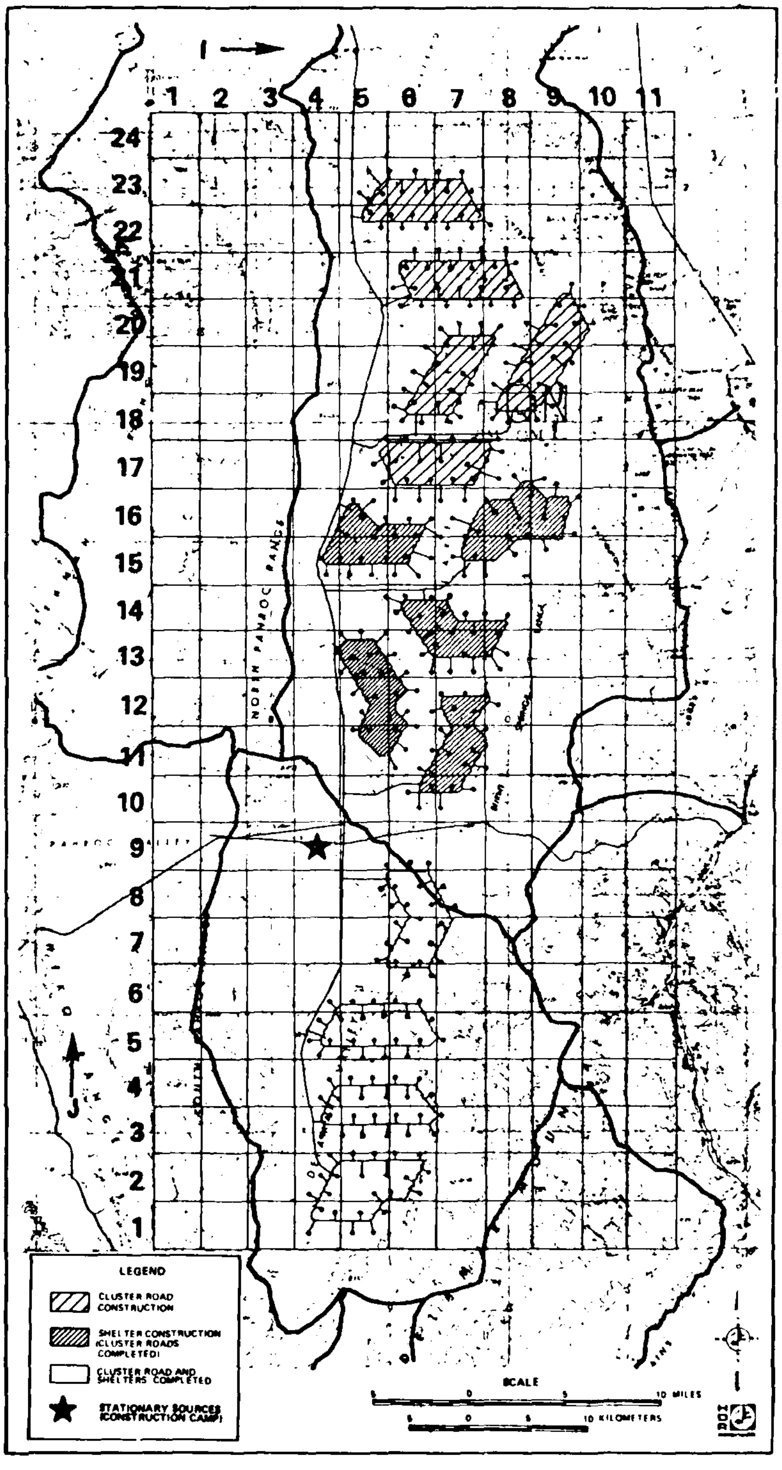


Figure 5.1.1-1 Emission grid for the Dry Lake/Delamar, Nevada construction group-loop system.

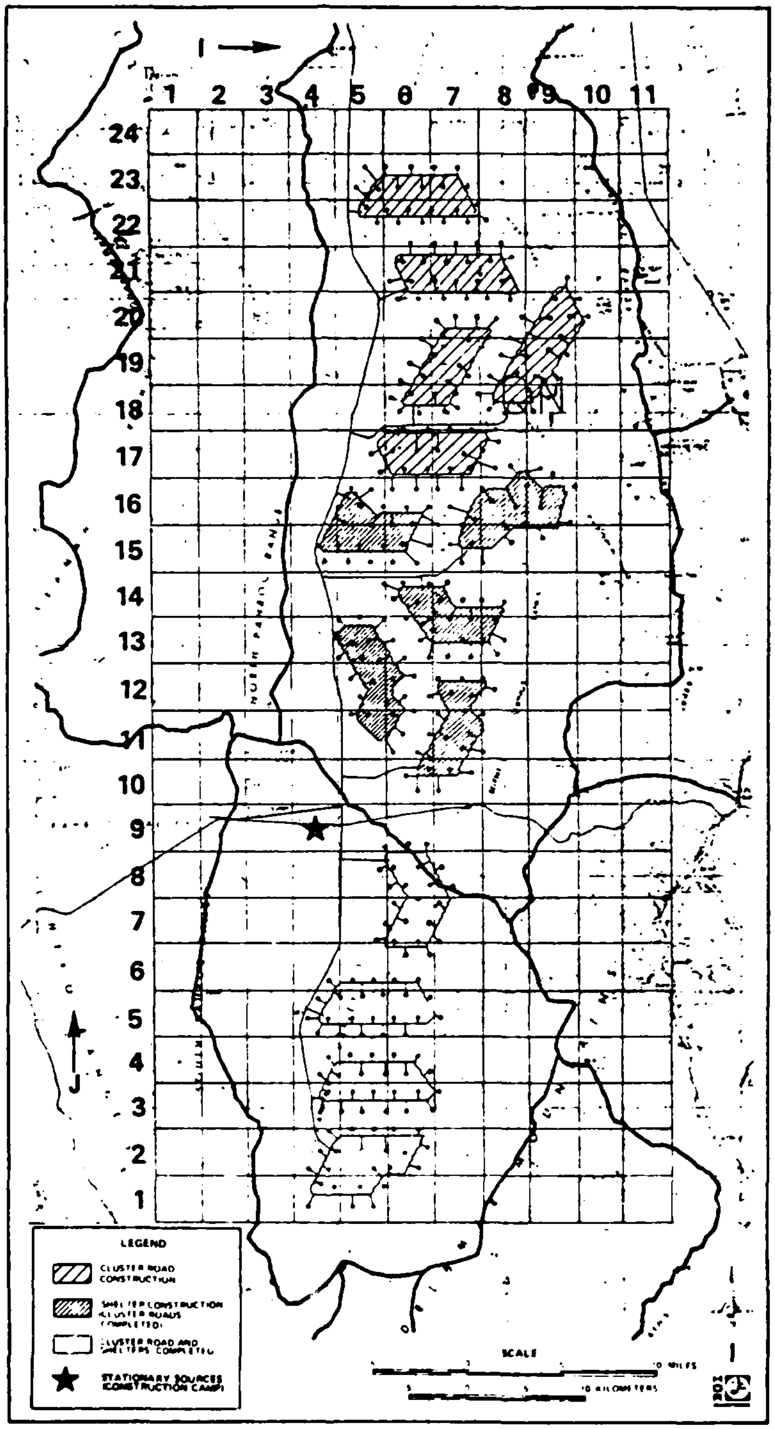


Figure 5.1.1-2 Emission grid for the Dry Lake/Delamar, Nevada, construction group, linear system.

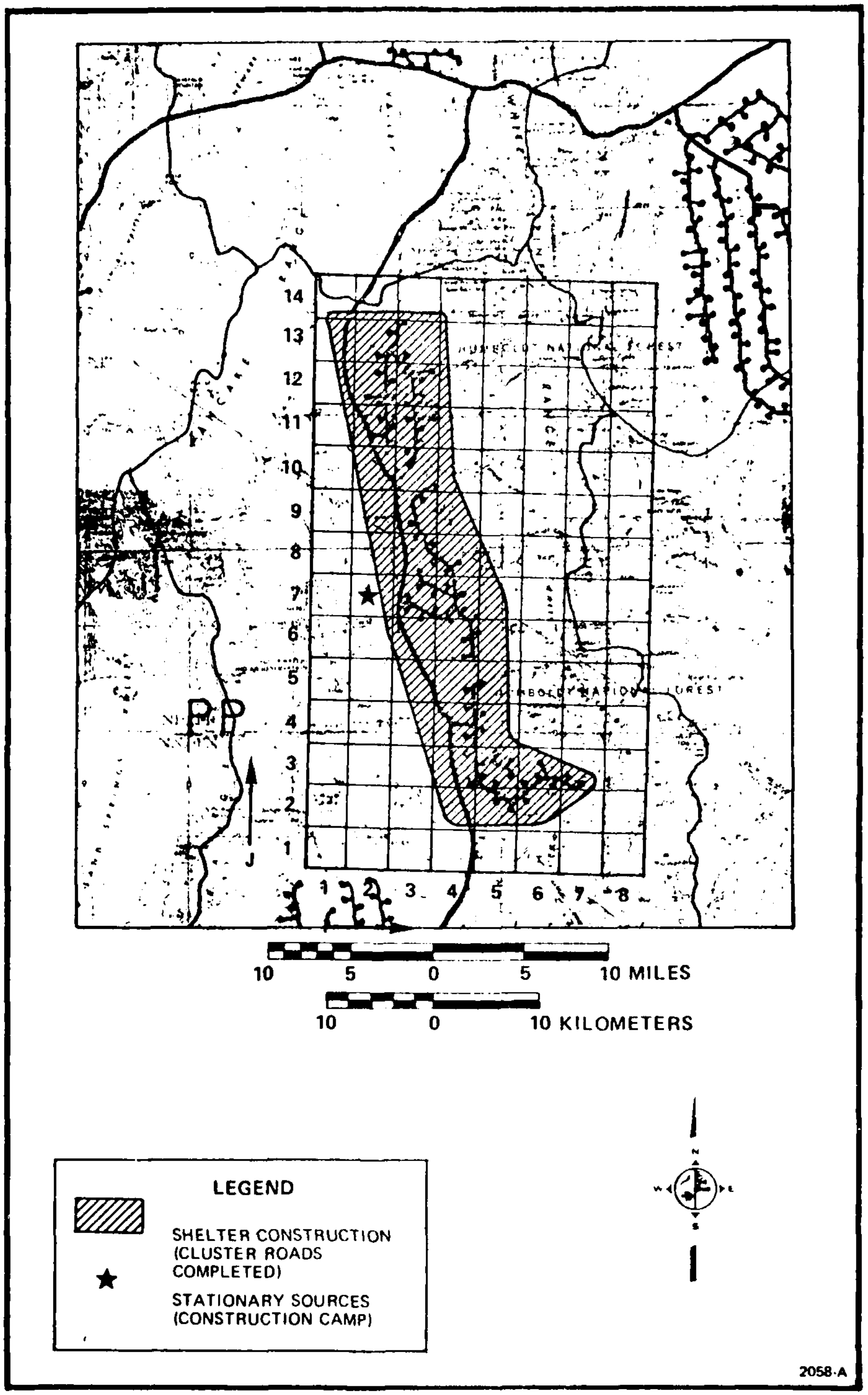


Figure 5.1.1-3 Emission grid for the Duckwater, Nevada, construction group - linear system.

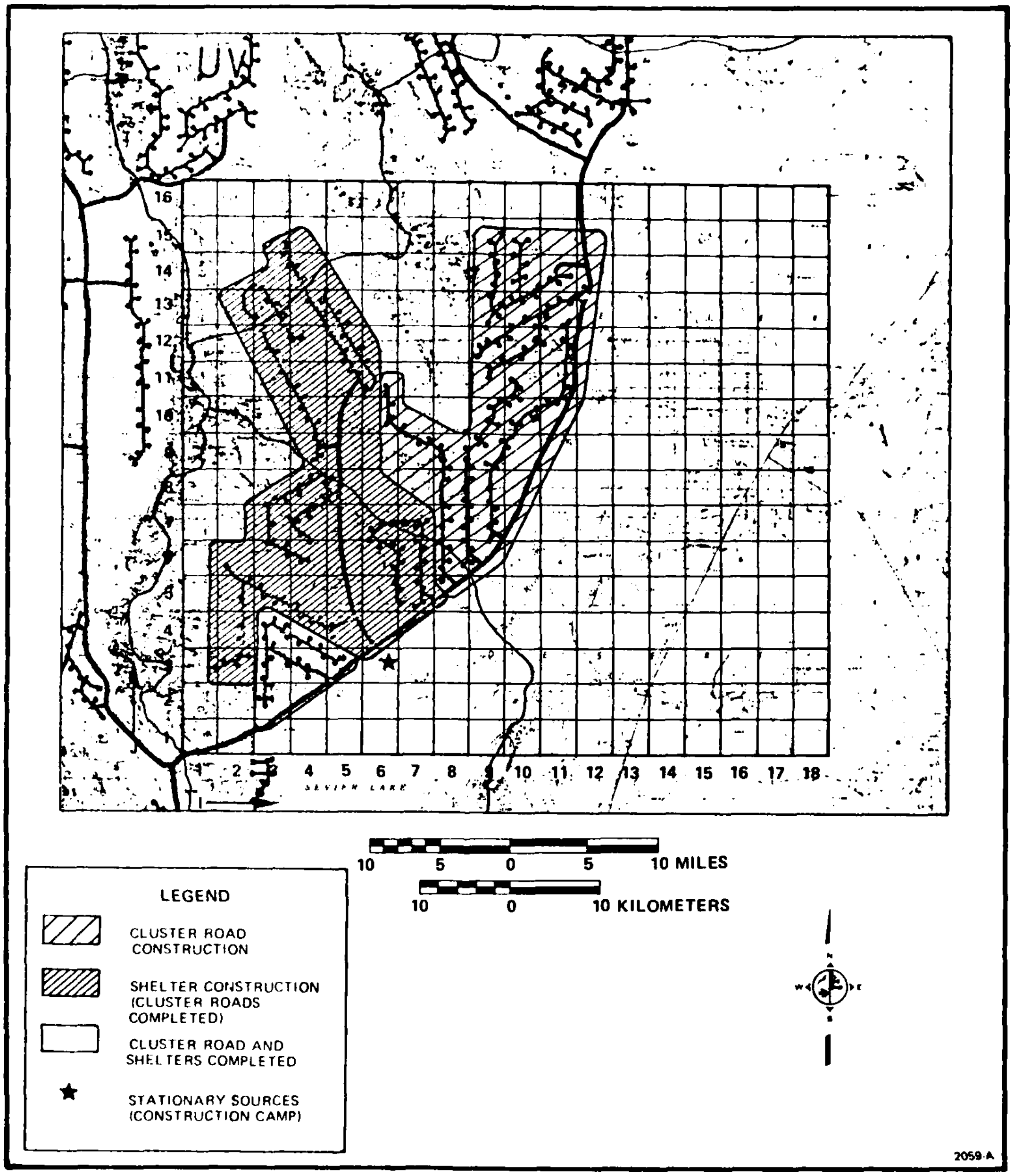


Figure 5.1.1-4 Emission grid for the Delta, Utah construction group - linear system.

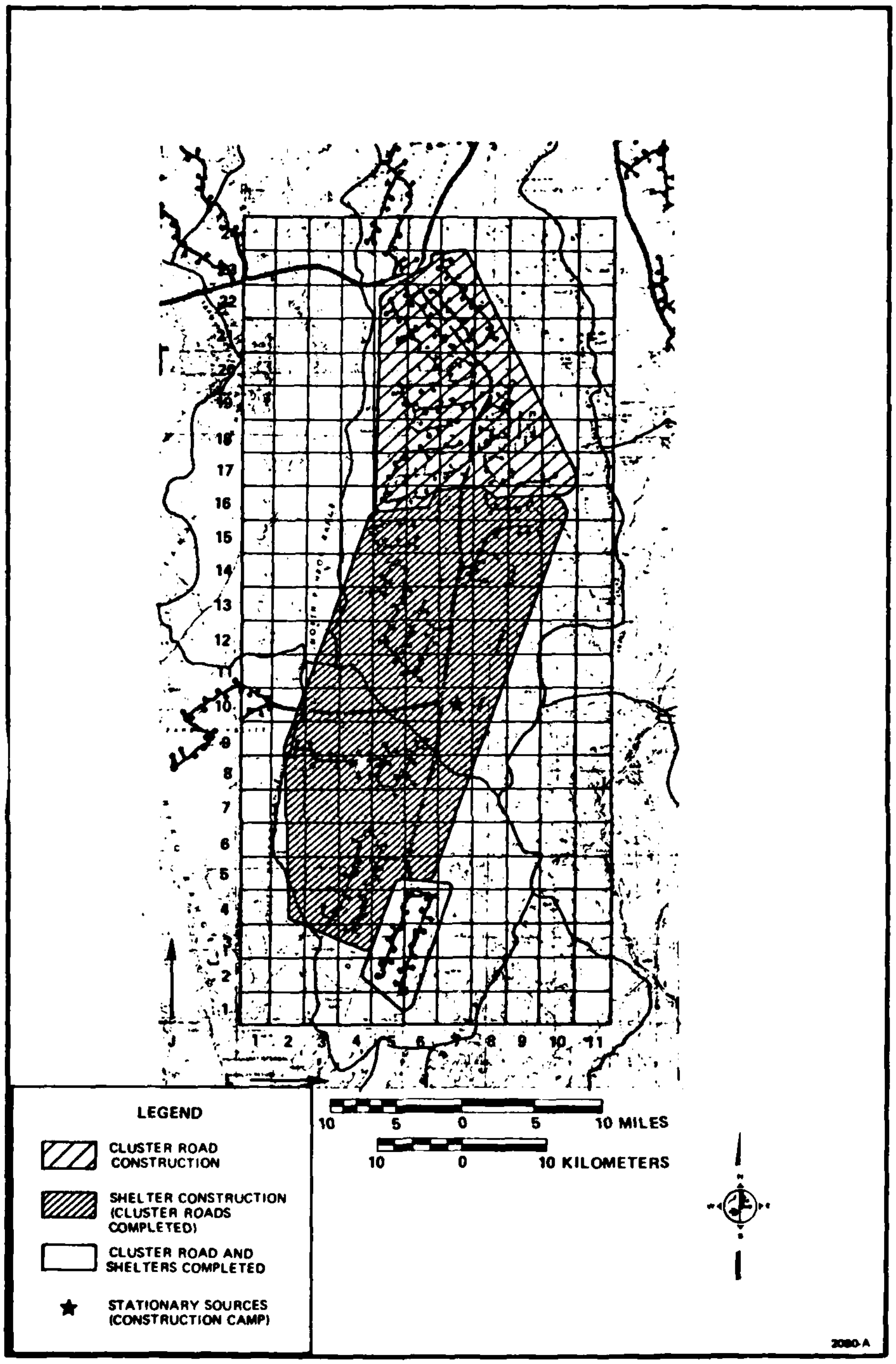


Figure 5.1.1-5 Emission grid for the Dalhart, Texas construction group - linear system.

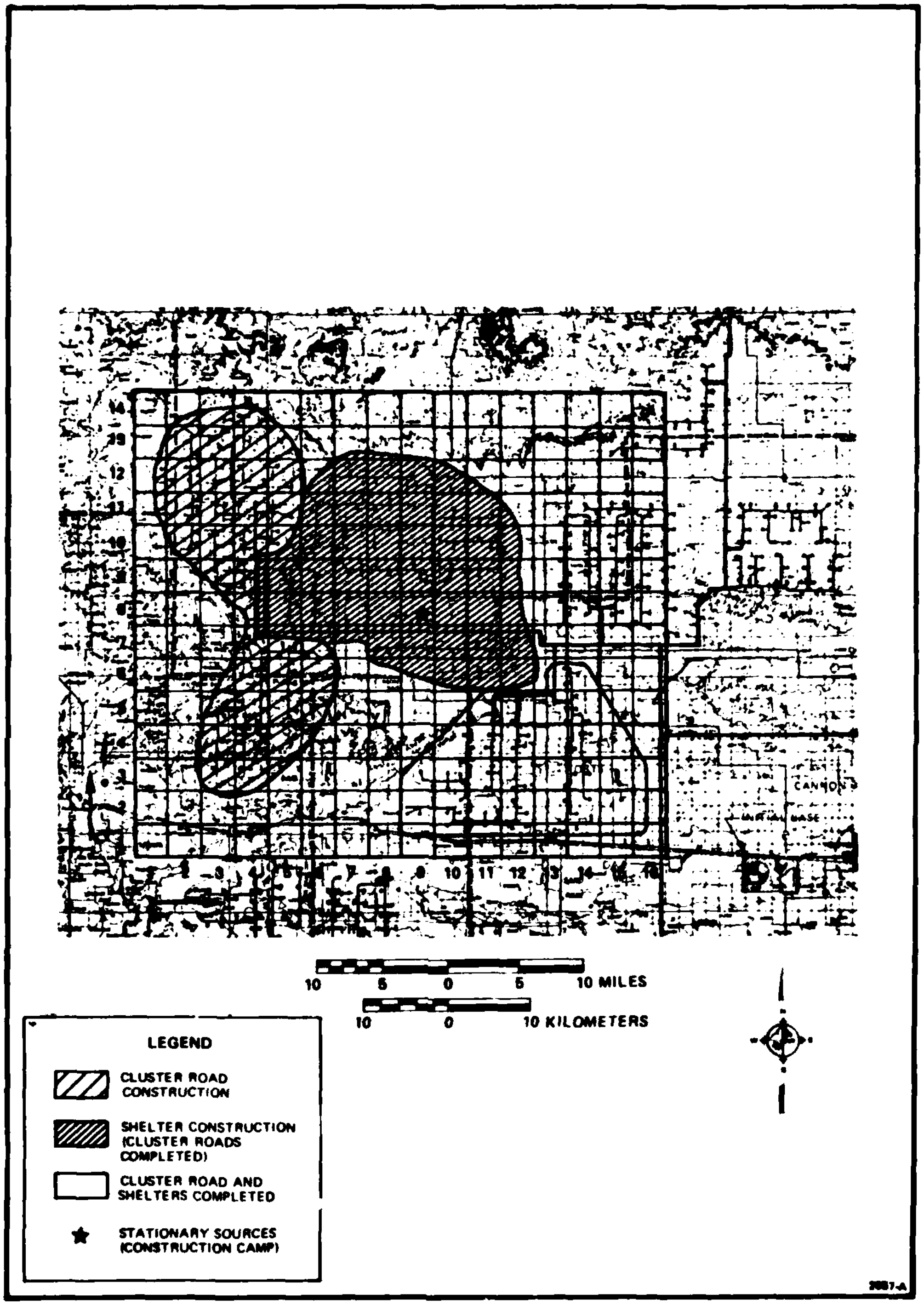


Figure 5.1.1-6 Emission grid for the Clovis, Texas construction group - linear system.

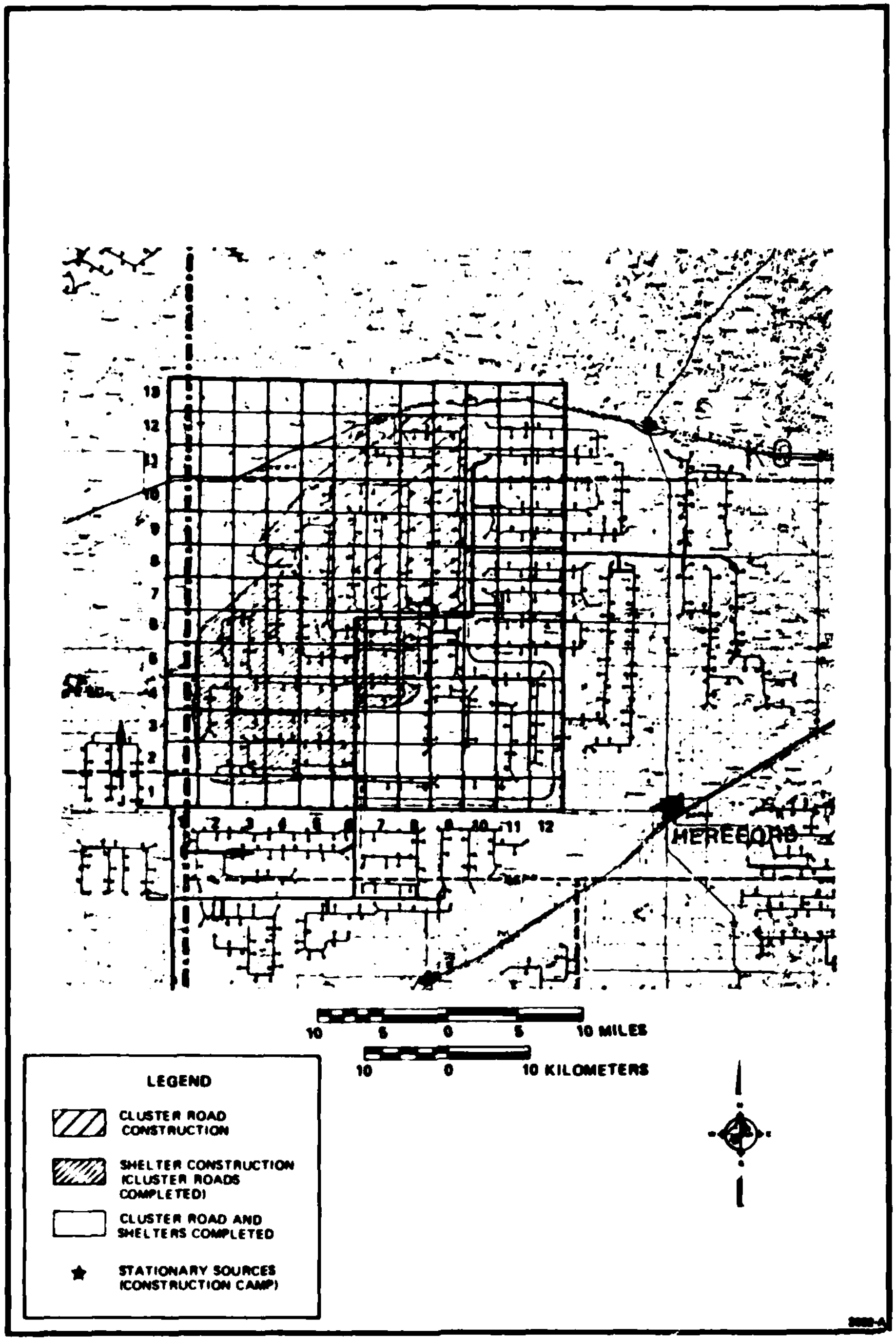


Figure 5.1.1-7 Emission grid for the Hereford, New Mexico construction group - linear system.

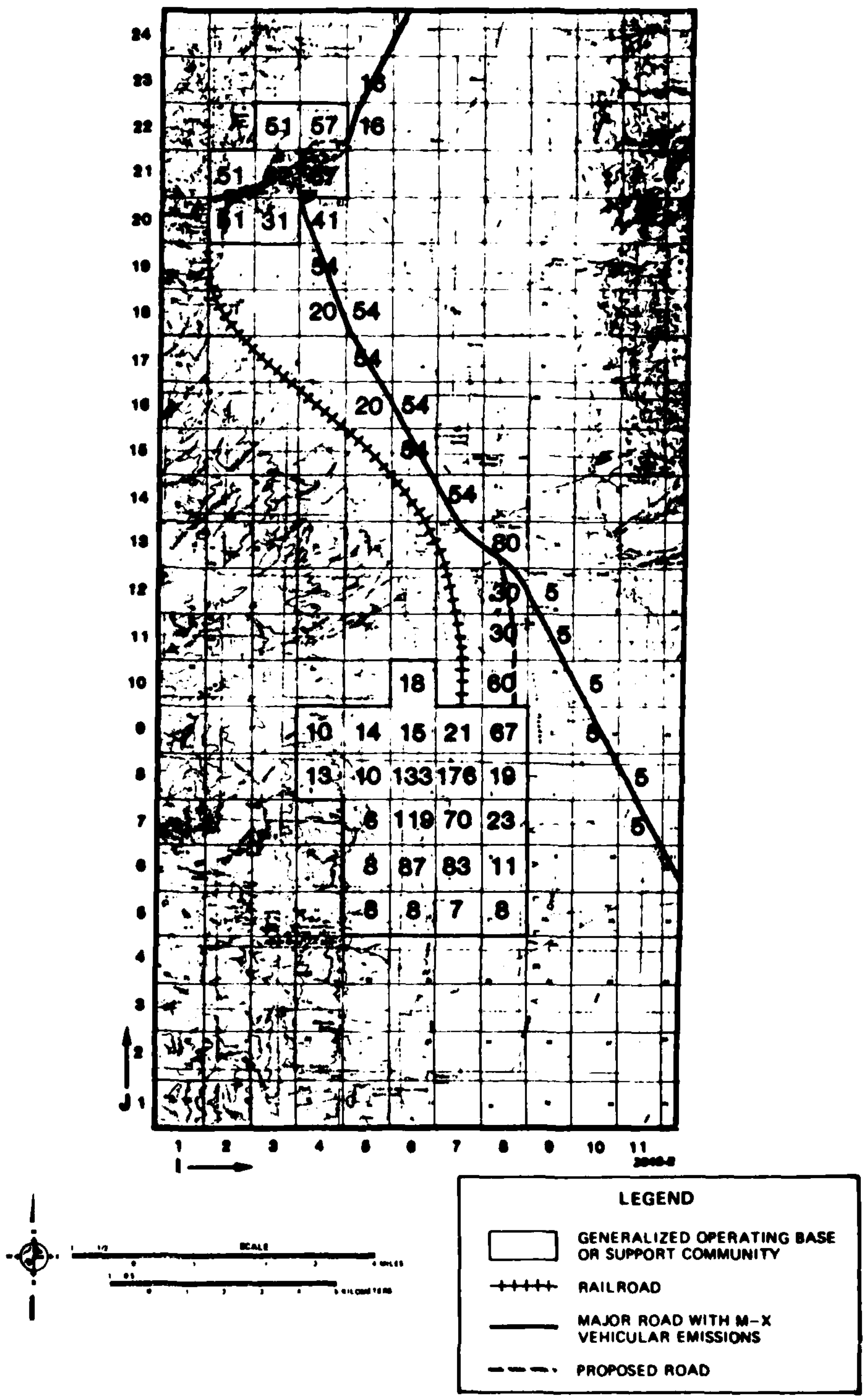


Figure 5.1.1-8 CO emissions and emission grid for the Ely OB site and community (emissions in g/sec).

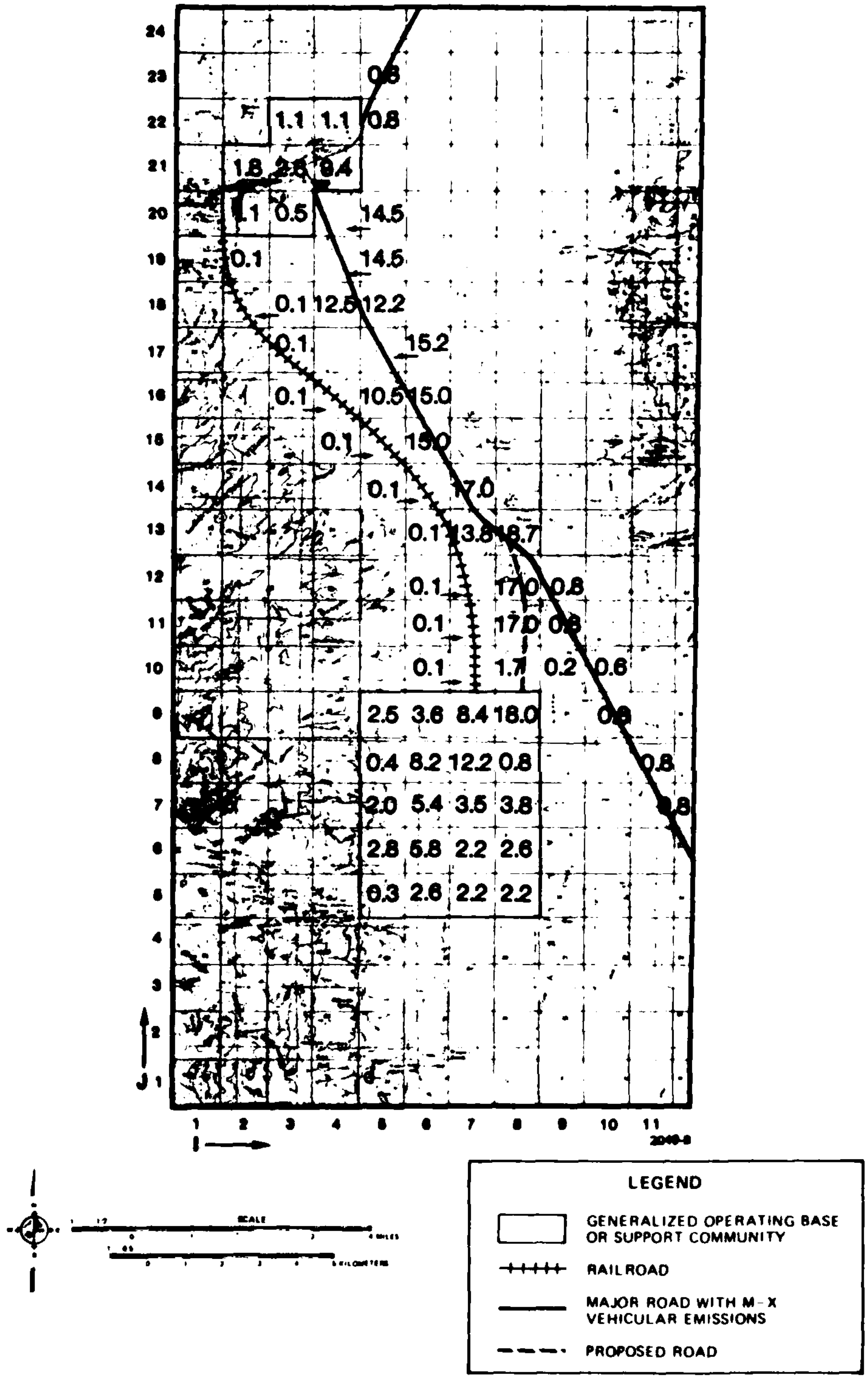


Figure 5.1.1-9 NO_x emission and emission grid for the Ely, OB site and community (emissions in g/sec).

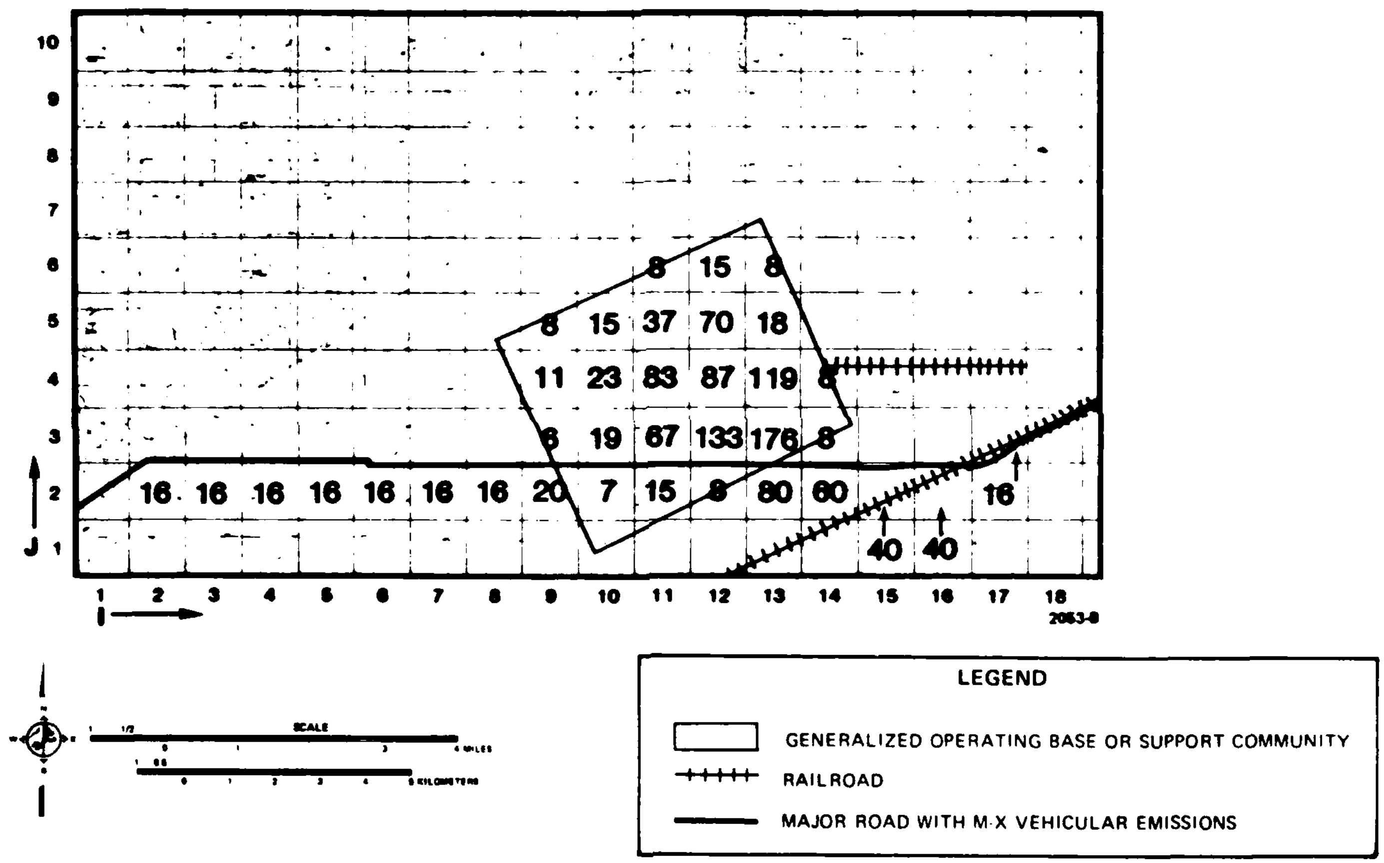


Figure 5.1.1-10 CO emissions and emission grid for the Beryl OB site (emissions in g/sec).

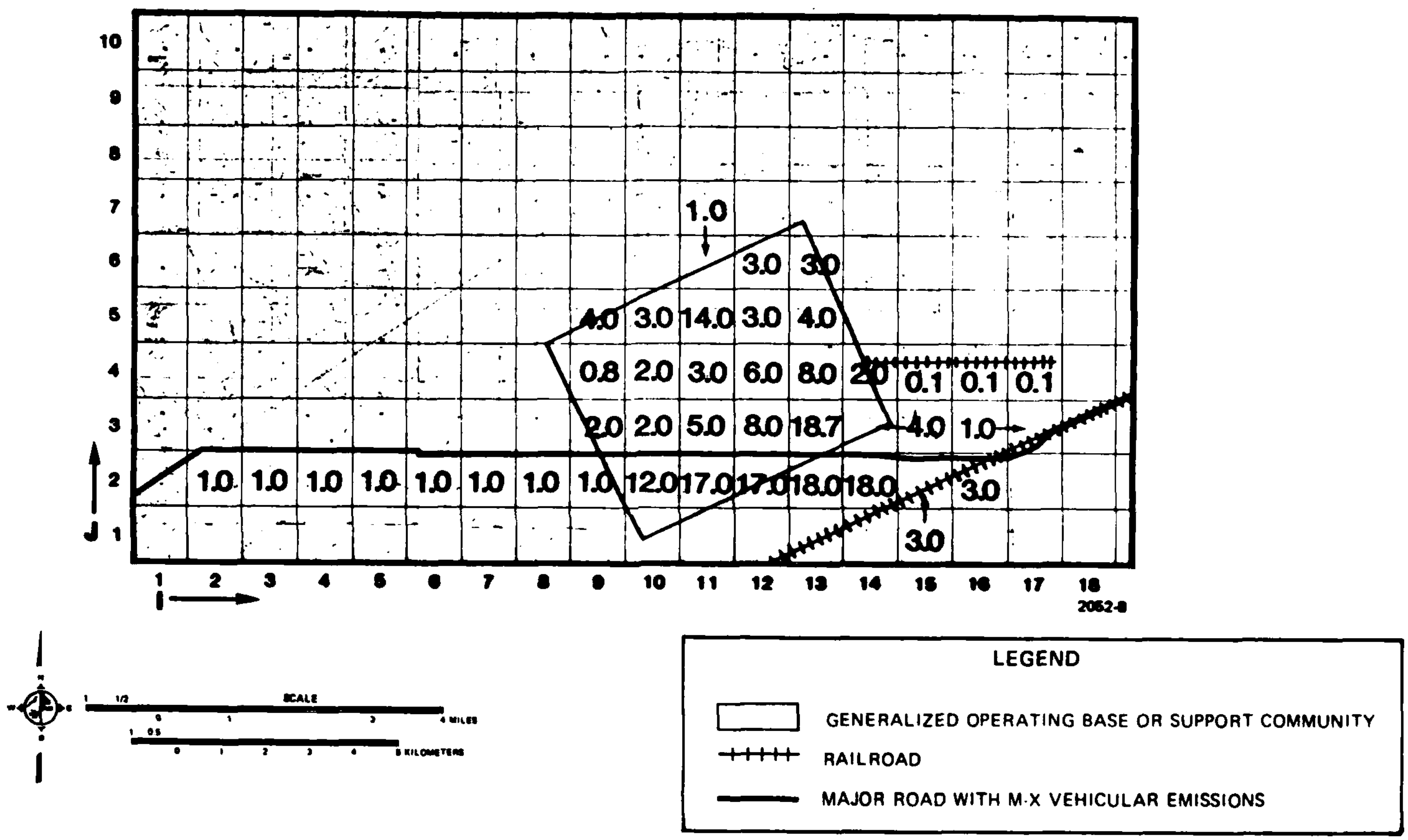


Figure 5.1.1-11 NO_x emissions and emission grid for the Beryl OB site (emissions in g/sec).

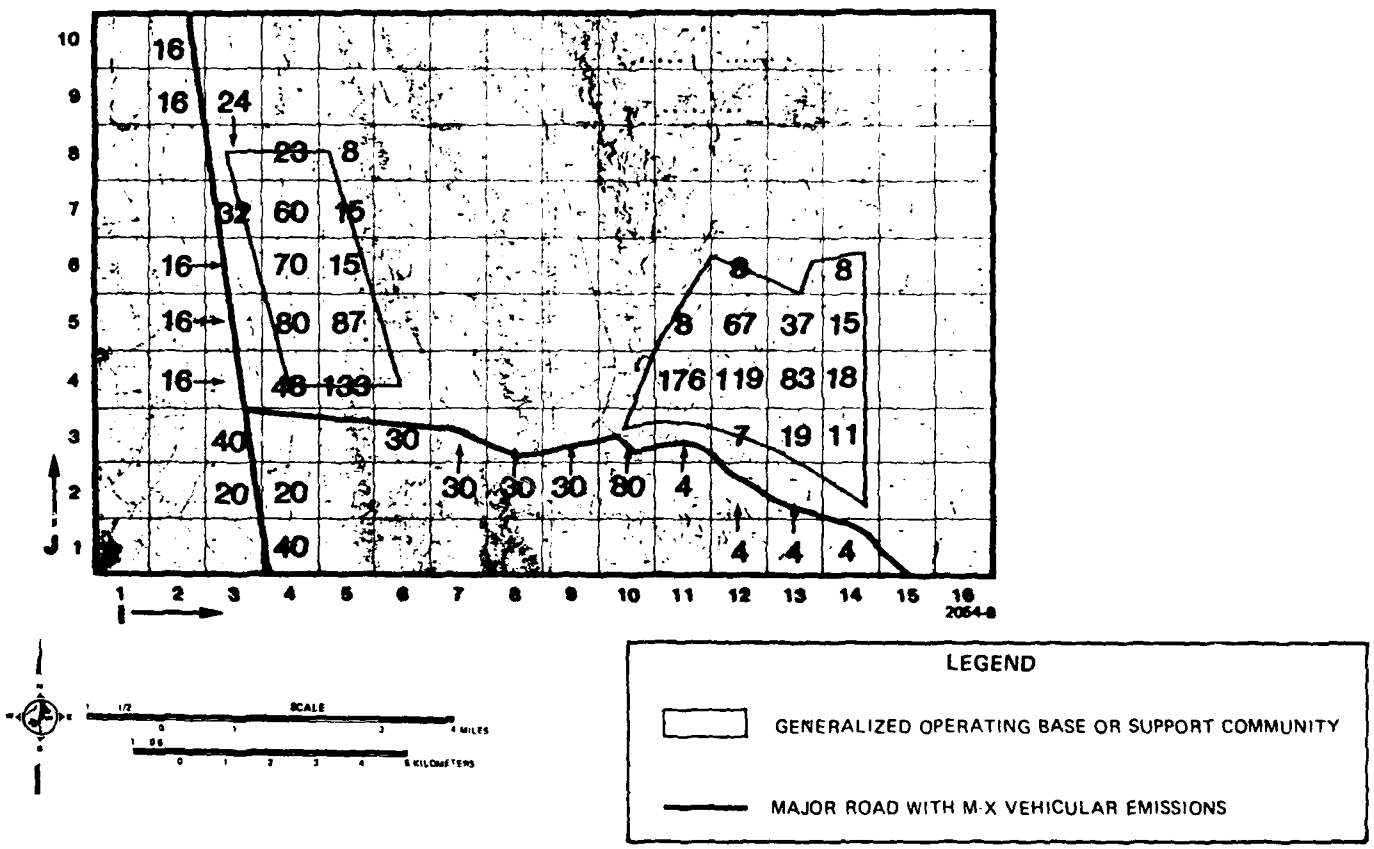


Figure 5.1.1-12 CO emissions and emission grid for the Coyote Spring OB site (emissions in *g/sec.*).

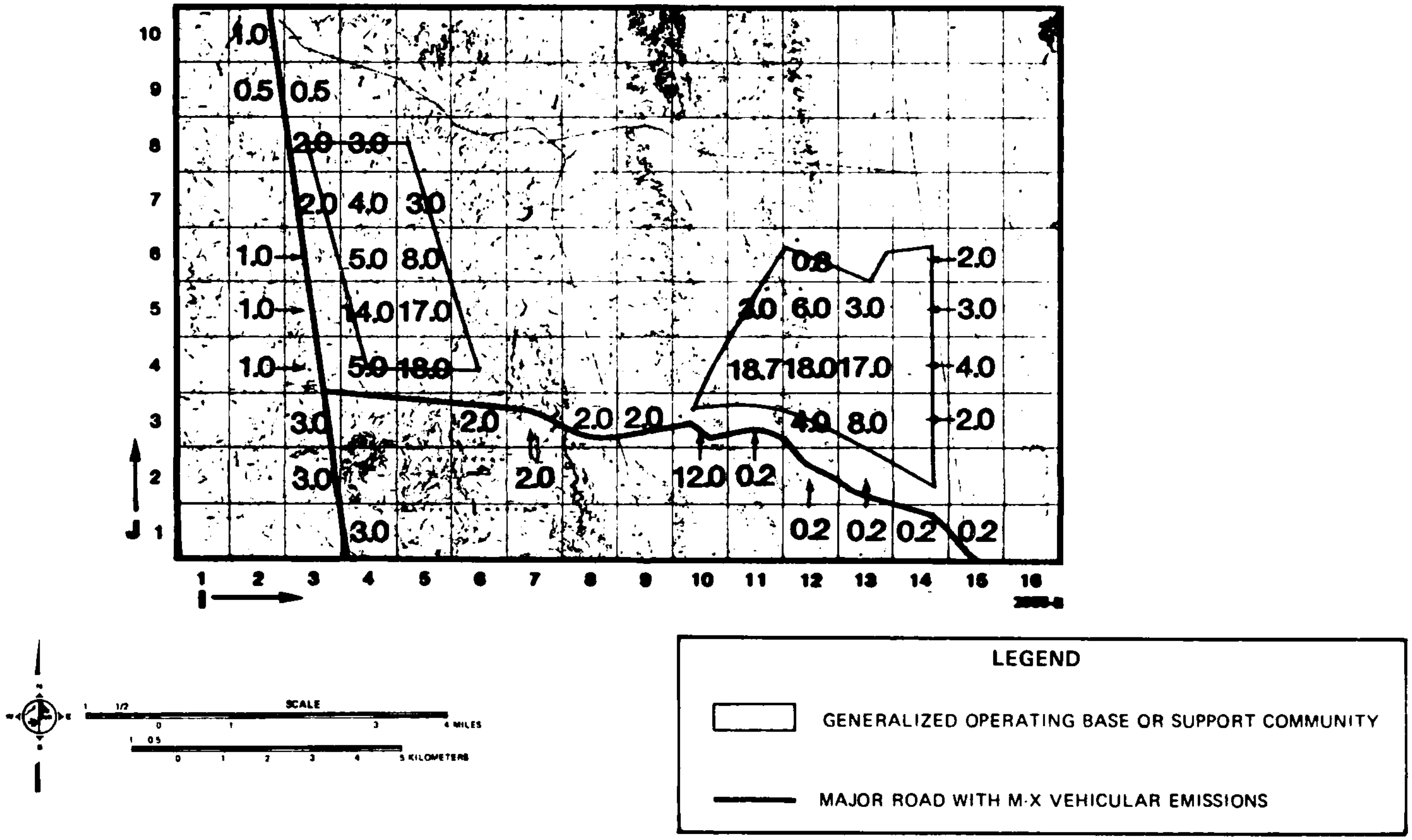


Figure 5.1.1-13 NO_x emissions and emissions grid for the Coyote Spring OB site (emissions in g/sec.).

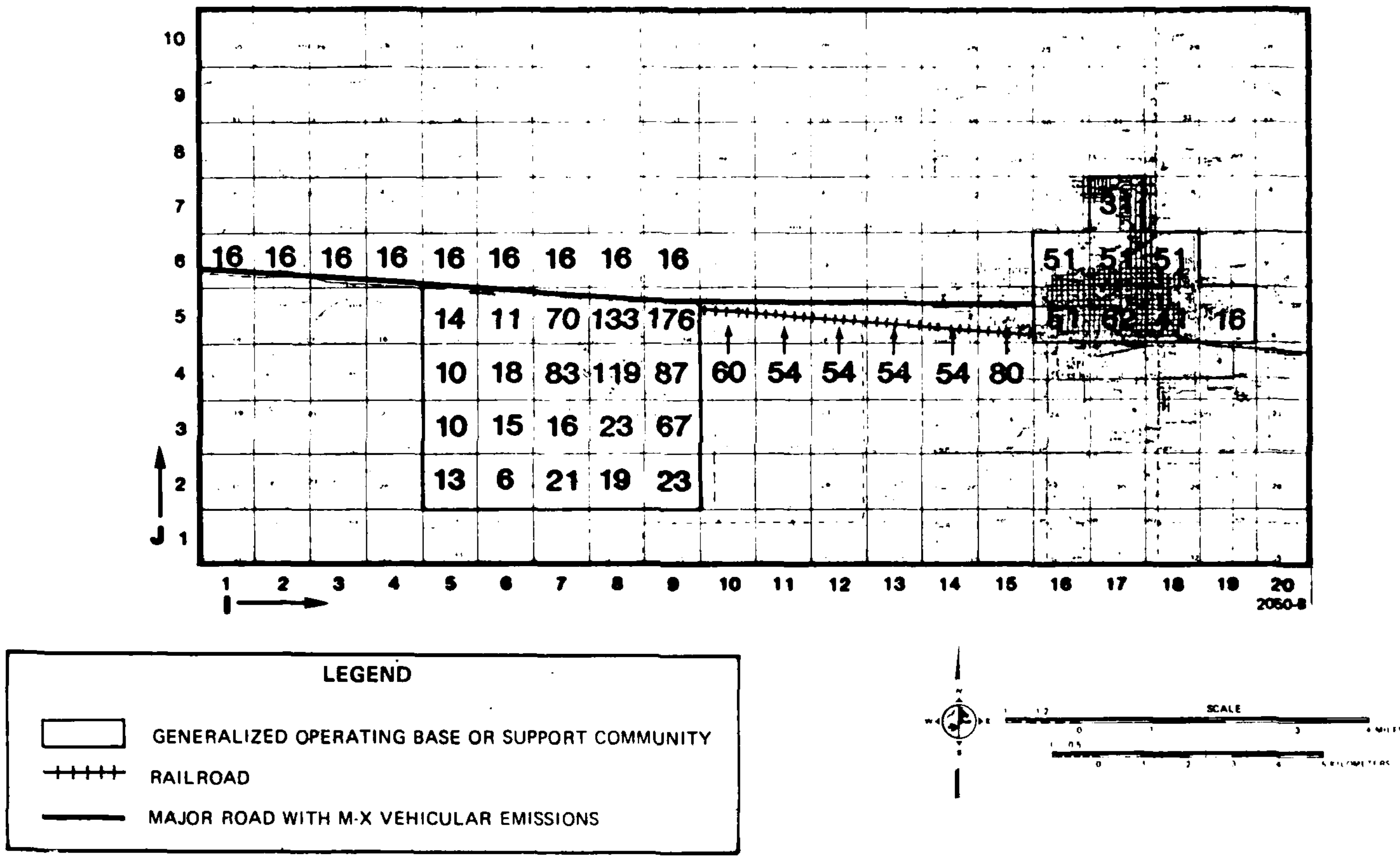


Figure 5.1.1-14 CO emissions and emission grid for the Clovis OB site and community (emissions in g/sec.).

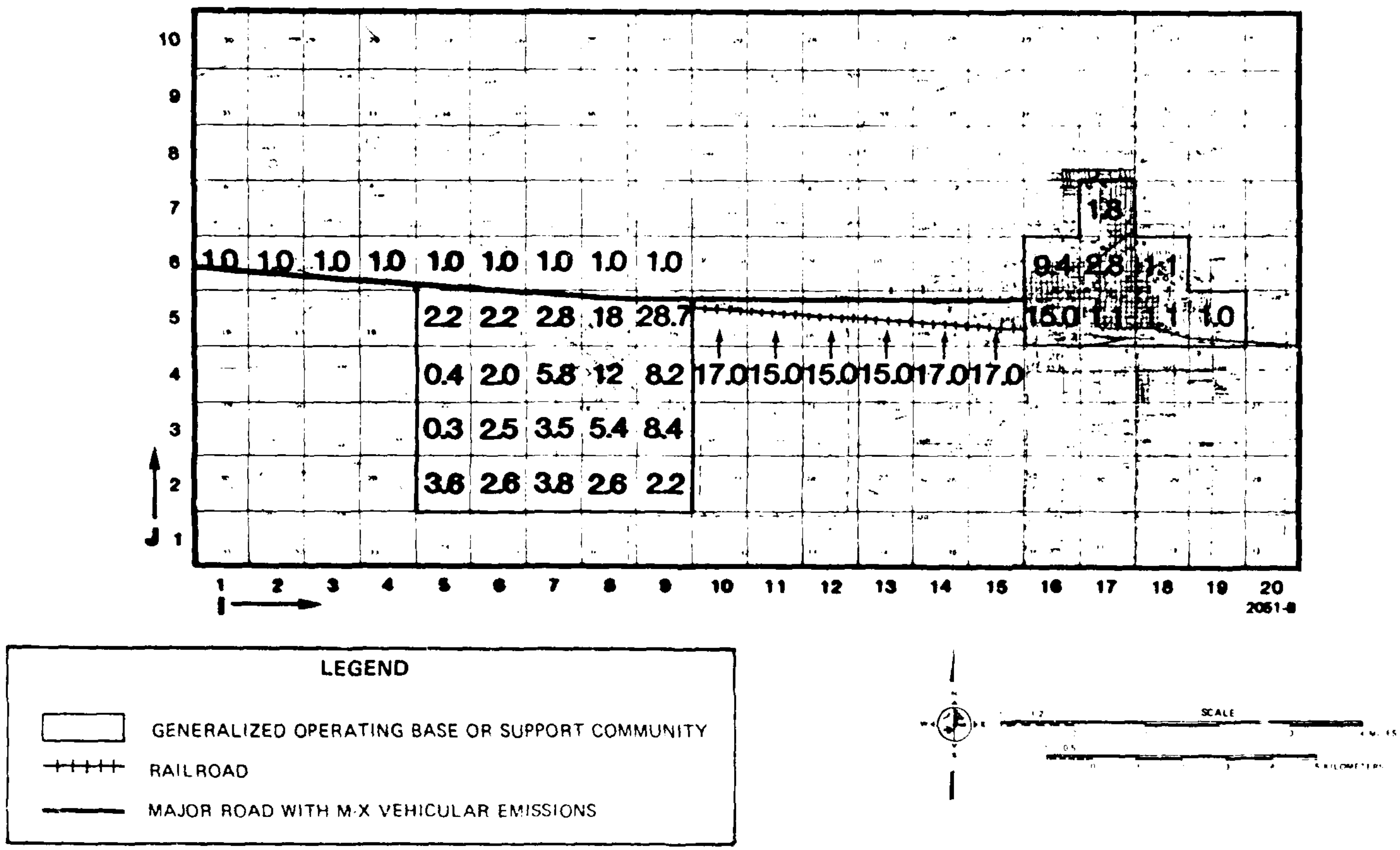


Figure 5.1.1-15 NO_x emissions and emissions grid for the Clovis OB site and community (emissions in g/sec.).

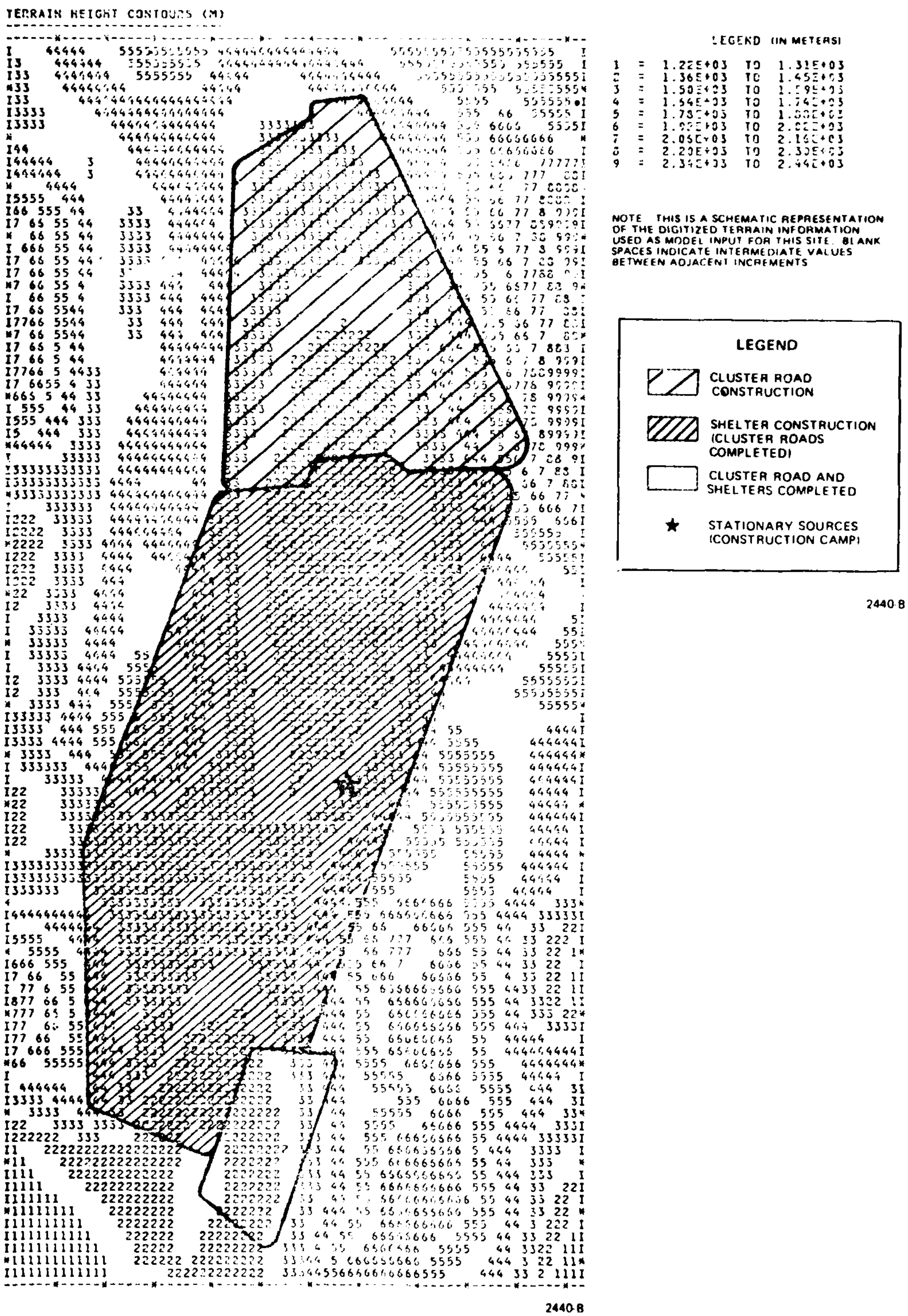
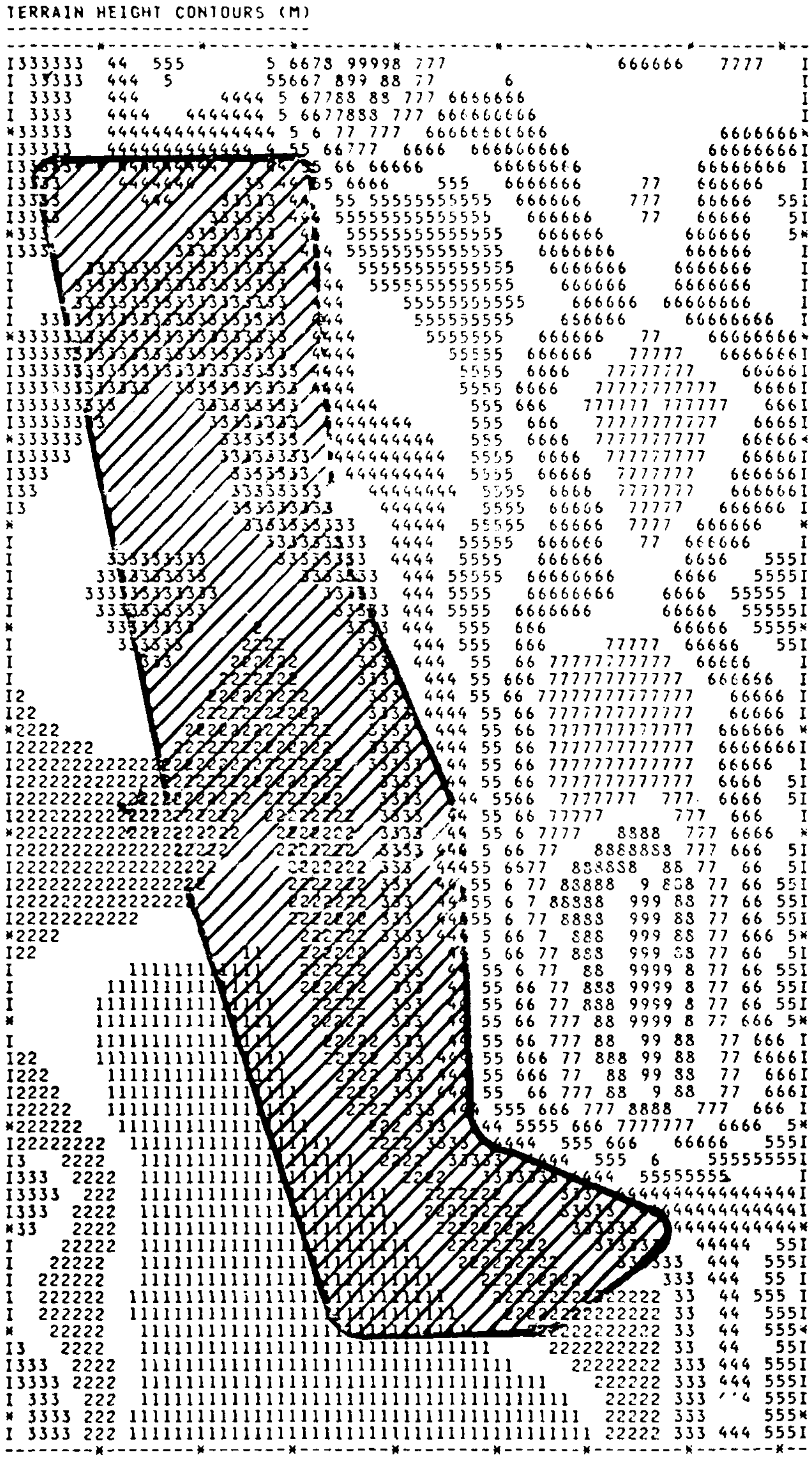


Figure 5.1.2-1. Digitized terrain for the Dry Lake/Delamar area.



LEGEND (IN METERS)

1	=	1.52E+03	TO	1.63E+03
2	=	1.68E+03	TO	1.79E+03
3	=	1.84E+03	TO	1.95E+03
4	=	2.00E+03	TO	2.10E+03
5	=	2.16E+03	TO	2.26E+03
6	=	2.32E+03	TO	2.42E+03
7	=	2.47E+03	TO	2.58E+03
8	=	2.63E+03	TO	2.74E+03
9	=	2.79E+03	TO	2.90E+03

NOTE: THIS IS A SCHEMATIC REPRESENTATION OF THE DIGITIZED TERRAIN INFORMATION USED AS MODEL INPUT FOR THIS SITE. BLANK SPACES INDICATE INTERMEDIATE VALUES BETWEEN ADJACENT INCREMENTS.

LEGEND

- SHELTER CONSTRUCTION (CLUSTER ROADS COMPLETED)
- ★ STATIONARY SOURCES (CONSTRUCTION CAMP)

2344-B

Figure 5.1.2-2. Digitized terrain for the Duckwater area.

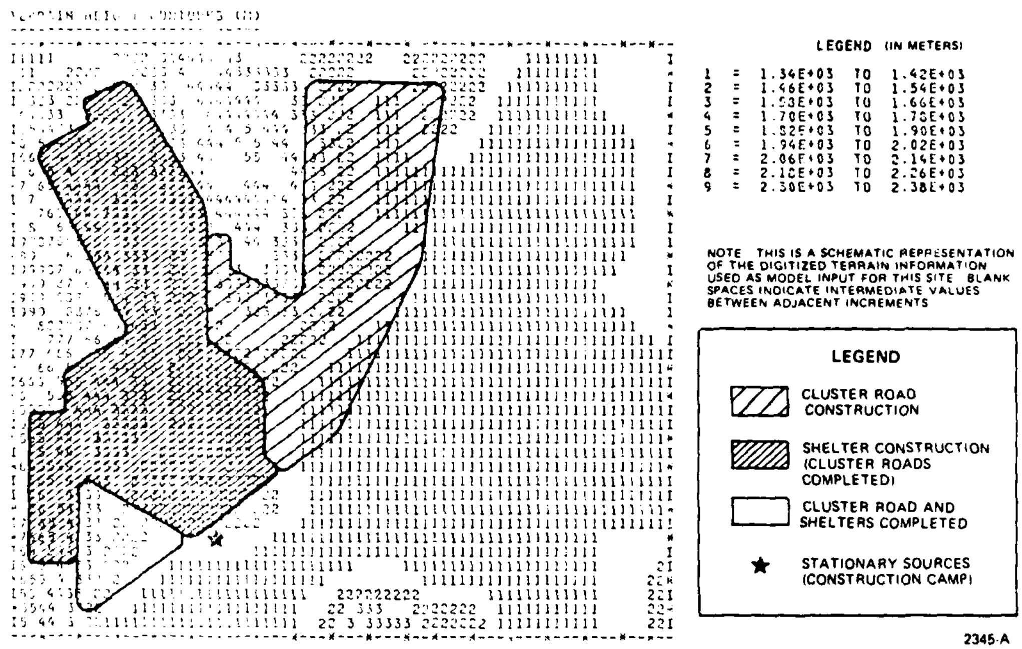


Figure 5.1.2-3. Digitized terrain for the Delta area.

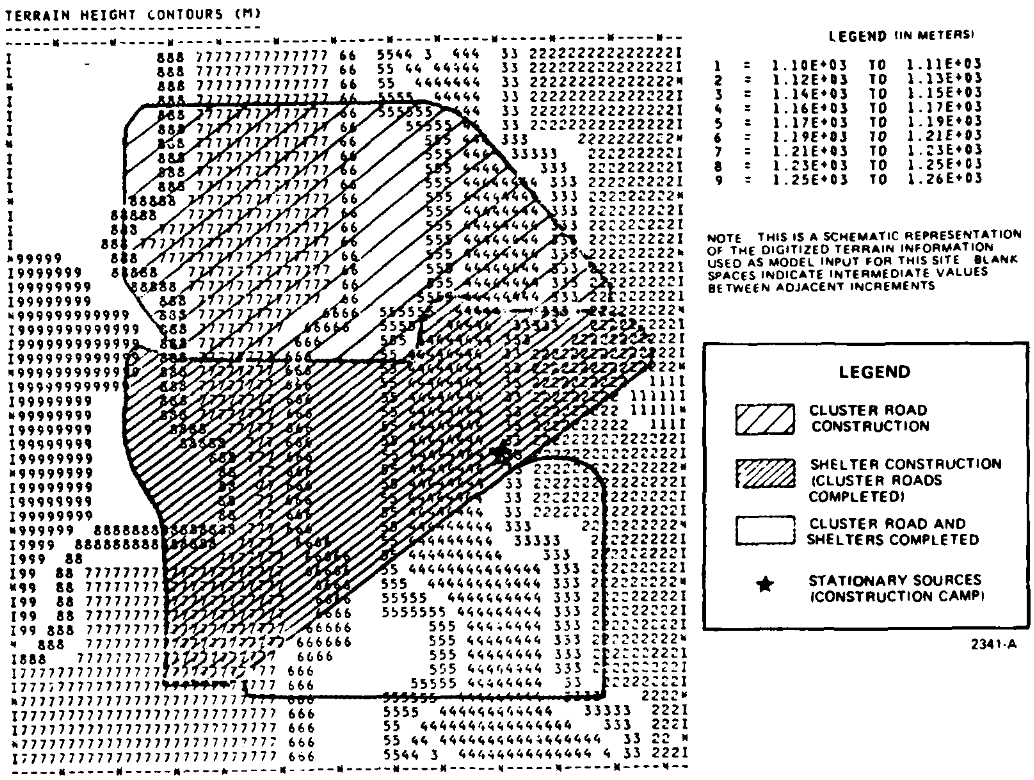


Figure 5.1.2-4. Digitized terrain for the Dalhart area.

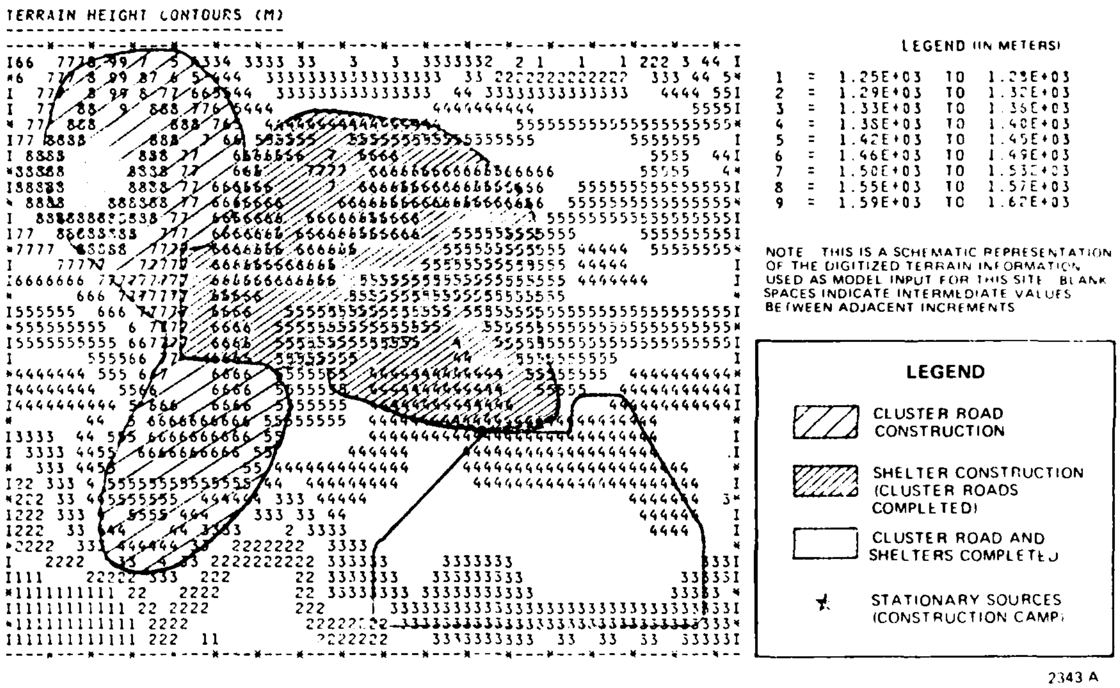


Figure 5.1.2-5. Digitized terrain for the Clovis area.

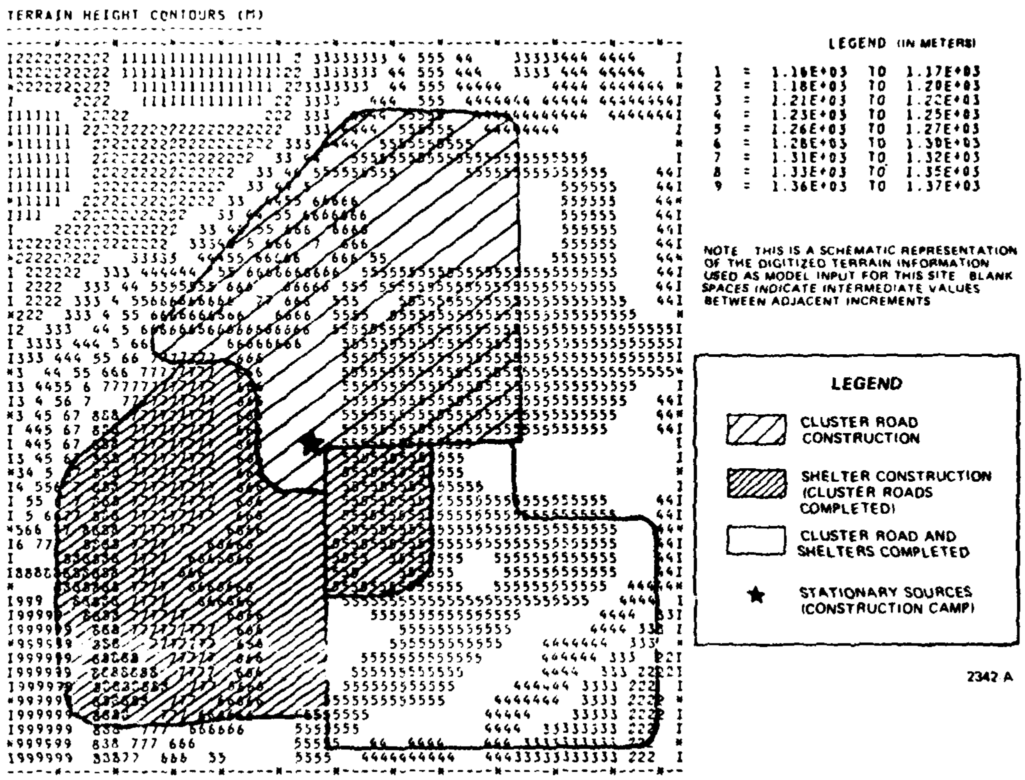


Figure 5.1.2-6. Digitized terrain for the Hereford area.

TERRAIN HEIGHT CONTOURS (M)

LEGEND

1	=	1.91E+03	TO	2.00E+03	METERS
2	=	2.04E+03	TO	2.12E+03	METERS
3	=	2.16E+03	TO	2.24E+03	METERS
4	=	2.29E+03	TO	2.37E+03	METERS
5	=	2.41E+03	TO	2.49E+03	METERS
6	=	2.53E+03	TO	2.62E+03	METERS
7	=	2.66E+03	TO	2.74E+03	METERS
8	=	2.78E+03	TO	2.86E+03	METERS
9	=	2.90E+03	TO	2.99E+03	METERS

NOTE BLANK SPACES INDICATE INTERMEDIATE VALUES BETWEEN ADJACENT INCREMENTS.

2027-A

Figure 5.1.2-7. Digitized terrain for the Ely OB site and community.

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TERRAIN HEIGHT CONTOURS (M)
---------------------------
---*---*---*---*---*--*---*---*---*---*---*--*---*---*---*---*---*---*--
I99999 999999 8888 7 66666 54 33333                  222222222222222222I
*999    9999 8  777 6666  5 4333333          22222222222222222222222222*
I88888888888  77 66666  55 4 33333       22222222222222222222222       I
I77  888   777 66555   55 44 333       22222222222222222222222         I
*  77777777 666 55  555 444 33        22222222222222222222            1*
I6666     66 555 4444444 333   22222222222222222222              111111I
*5   666666 5 44444  3333   22222222222222222222              111111111*
I55555555555 4444  33333  2222222222222222222            11111111111111I
I     444444444  33333   222222222   1  222          111111111111111111I
*   44444      33333   222222222222  1   2          1111111111111111111*
I55  44    3333333   22222222222222               111111111111111111111I
*655  44 33333     2222222                     111111111111111111111111*
I55 44 333333    2222222                    111111111111111111111111111I
I 444 33333   22222222                    11111111111111111111111111111I
*44  3333   22222222      111111111111111111111111111111111111111111111*
I  3333   22222222       1111111111111111111111111111111111111111111111I
*3333   222222222      111111111111111111111111111111111111111111111111*
I33    22222222      11111111111111111111111111111111111111111111111111I
I    222222222      111111111111111111111111111111111111111111111111111I
*   222222222     11111111111111111111111111111111111111111111111111111*
I   22222222     111111111111111111111111111111111111111111111111111111I
*3  2222222     1111111111111111111111111111111111111111111111111111111*
I33 222222      1111111111111111111111111111111111111111111111111111111I
---*---*---*---*---*--*---*---*---*---*---*--*---*---*---*---*---*---*--
```

LEGEND

1	=	1.57E+03	TO	1.62E+03
2	=	1.65E+03	TO	1.70E+03
3	=	1.73E+03	TO	1.78E+03
4	=	1.81E+03	TO	1.86E+03
5	=	1.88E+03	TO	1.94E+03
6	=	1.96E+03	TO	2.02E+03
7	=	2.04E+03	TO	2.10E+03
8	=	2.12E+03	TO	2.18E+03
9	=	2.20E+03	TO	2.26E+03

NOTE: BLANK SPACES INDICATE INTERMEDIATE VALUES BETWEEN ADJACENT INCREMENTS.

2206-A

Figure 5.1.2-8. Digitized terrain for the Beryl OB site and community.

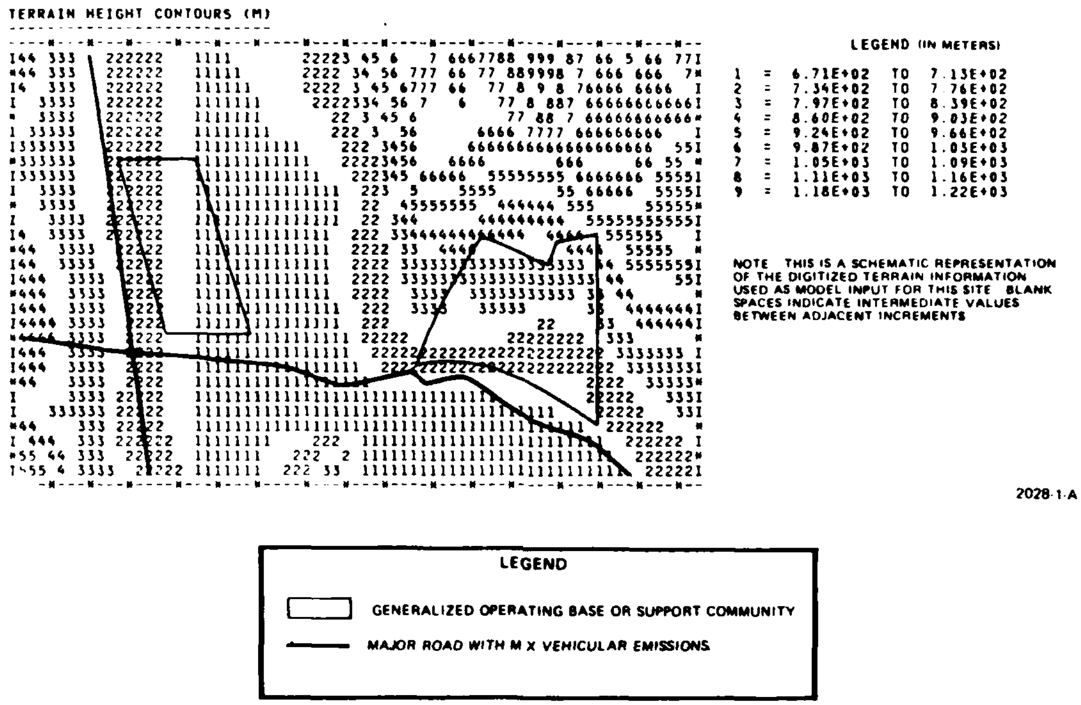

Figure 5.1.2-9. Digitized terrain for the Coyote Spring, Nevada, OB site.

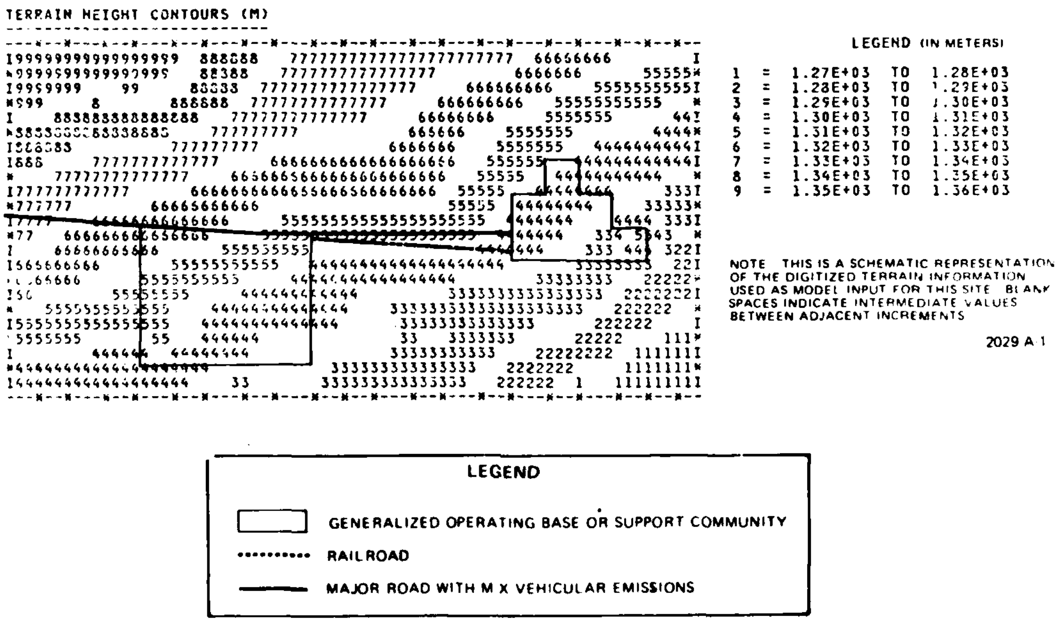

Figure 5.1.2-10. Digitized terrain for the Clovis, New Mexico, OB site and community.

PREDICTED POLLUTANT CONCENTRATIONS - NEVADA/UTAH (5.1.3)

Construction and operating activities related to the M-X will result in the emission of several atmospheric pollutants. These include total suspended particulates (TSP), nitrogen oxides (NO_x), sulfur oxides (SO_x), carbon monoxide (CO), and hydrocarbons (HC). By far the most abundant pollutant emission will be TSP, which occurs chiefly due to excavation, wind erosion, and vehicular traffic over cluster roads as well as activities occurring at the facilities producing road and shelter materials. Particulate emissions during operation of the system will be a small percentage of the construction phase and emissions will consist chiefly of vehicle emissions and wind erosion from exposed surfaces.

The amended Clean Air Act specifies federally allowable ambient concentrations of atmospheric pollutants through regulations called the National Ambient Air Quality Standards (NAAQS). Additionally, regulations for the Prevention of Significant Deterioration (PSD) specify that ambient air quality in clean air areas will be allowed to deteriorate only to a limited amount due to new emission sources, depending on a three-tiered land classification system. Individual states have promulgated regulations that are more restrictive than the federal regulations. Activities associated with M-X will need to comply with all federal and state air quality standards.

An important short-term impact of M-X on air quality could be in the reduction of visibility resulting from the large amount of dust generated in construction. Good visibility is considered an important value in the West where many scenic vistas exist. Additionally, the state of Nevada has promulgated a standard dealing with visibility and federal visibility legislation will be forthcoming shortly.

The air quality impacts of M-X-related activities are important for several reasons. The relationship of the impacts to air quality and visibility standards as well as to the public perception of acceptable impact will, to a large extent, determine the type of mitigation strategies necessary. This will be particularly true for the generation of dust. Limitation of dust emissions to acceptable rates could affect construction activities significantly. The impacts of dust generation could directly affect water resources if water is to be used for dust suppression. Air quality impacts of M-X activities will also directly affect occupational and public health as well as aesthetic values.

Construction-Related Particulate Pollutant Impacts

The effect on atmospheric resources of fugitive dust (particulate) emissions was assessed using the Integrated Model for Plumes and Atmospherics in Complex Terrain (IMPACT). The model was employed to predict regional (large scale) particulate concentrations resulting from cluster road and shelter construction. IMPACT is a three dimensional grid model capable of quantifying the effect of reactive and/or inert emissions. The model accounts for the influence of vertical temperature stratifications on wind and diffusion fields, and for shear flows created by the atmospheric boundary layer and terrain. The primary reason for choosing the IMPACT model (non-Gaussian) was this treatment of wind flows in regions with complex terrain. Gaussian models require that the wind flow be of uniform direction and speed for the time period simulated (usually one hour). IMPACT is capable of more closely simulating actual wind flow patterns such as valley drainage winds, a condition typical of the hydrographic basins of Nevada and Utah. The

highest pollutant concentrations are expected to result from occurrences of valley drainage winds and a low inversion layer which trap pollutants on the valley floor. Therefore, it was essential to be able to reasonably model the complexity of valley wind flows. The IMPACT model requires three types of data before performing an analysis for a given region: (1) meteorological data ordered as to location and time of occurrence, (2) emissions data ordered as to location and time of occurrence, and (3) digitized terrain information. Information on these data are given in Sections 4.2.2, 5.1.1, and 5.1.2 respectively.

Estimates of particulate emissions during construction of the shelters, cluster roads, and DTN roads were calculated for several mitigation scenarios. Emission estimates are calculated for each construction group with a level of construction activity with the highest particulate emission rate.

Particulate emissions during construction will occur from stationary sources that produce and process construction materials for the roads and shelters (asphaltic concrete, aggregate, and bituminous surfacing), construction activities (blasting, excavation, and dirt moving), road dust from vehicular traffic over unpaved roads, and wind erosion of unpaved surfaces. Emission factors used to determine the emissions for each of the sources are given in Section 4.1.2.1 along with the calculated emission rates.

Two emission scenarios were considered: "worst case," and "probable case." The worst case scenario produces the largest emission rates. Under the worst case scenario, no mitigative measures to control emissions are applied except for oiling the DTN roads. The dust emission factor for vehicular traffic on cluster roads are calculated using worst case conditions for soil and meteorology and the average vehicle speed is 45 mph.

The probable case scenario incorporates the most likely physical conditions for soil and meteorology with a commonly applied combination of mitigative measures. As with worst case, average vehicle speeds are 45 mph. The mitigative measures assumed include cost-effective control equipment for stationary sources that process or produce construction materials and watering of roads, aggregate storage piles and construction activities. Watering is assumed to reduce emission rates by fifty percent.

Construction groups from the Nevada/Utah area were selected for air quality modeling that are either representative of a large set of construction groups, or that have unique emission, meteorological, or geographic characteristics.

Table 5.1.3-1 lists the construction groups that are selected for air quality modeling in Nevada and Utah.

The Dry Lake-Delamar construction group was selected for modeling because it is a topographically and meteorologically representative valley in the Nevada/Utah DAA and because it has a relatively large number of clusters, providing a conservative, or upper level, of emissions. For comparison between the linear and loop systems, both linear and loop configurations are modeled with probable case emission rates. Worst case and probable case emission rates are modeled with the loop configuration to determine the air quality benefit to be gained by applying probable control measures.

A construction time period when the highest dust emissions levels are produced is selected to model. In the loop configuration, the most intense

Table 5.1.3-1. Construction groups in Nevada and Utah selected for air quality modeling.

NAME	HYDROGRAPHIC BASIN NO.	NO. OF CLUSTERS IN GROUP
Dry Lake-Delamar	181 & 182	11
Delta	46	11
Duckwater	173B	3

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construction activity level period occurs when cluster road construction occurs at five clusters, shelter construction occurs at five clusters (where cluster roads are completed), and construction is completed at four loops and the DTN roads are constructed and oiled.

The total number of clusters in Dry Lake-Delamar valleys are reduced from 14 to 11 in the linear system. This does not significantly alter particulate emission rates or resulting concentrations as discussed later. The most intense construction activity period occurs when five clusters are under shelter construction, five clusters are under cluster road construction, the DTN road is completed and oiled, and only one cluster is fully constructed.

Probable emissions for the linear Delta configuration group are identical to those used for the linear Dry Lake-Delamar group except that wind erosion emissions from completed clusters are reduced to one-fourth of the Dry Lake-Delamar emissions. The emissions are distributed to the appropriate grid cells according to expected activity rate. Cluster road construction, which is dustier than shelter construction, was placed in the clusters nearest Delta to determine the effects on the town during the most intense construction activity period expected.

The Duckwater area was selected to model because of the configuration under the linear system of a small number of clusters within a narrow valley. All clusters were assumed to have cluster road construction activity, which produces more dust emissions than shelter construction.

The meteorological conditions modeled in the IMPACT code for the Delamar/Dry Lake Valley are presented for representative hours in Section 4.2.2. Site-specific meteorological data were not available. Stability data were therefore extracted from studies which determined lapse rates from soundings in an area of Nevada similar to the Delamar/Dry Lake region. A typical pattern of early morning inversion, which breaking up in mid-morning, followed by mostly neutral conditions with some low level thermal instability in the afternoon, is used as the modeling conditions. This pattern was coupled with typical valley wind conditions determined by subjective analysis. In general it was assumed that low-level winds would be flowing downslope in the early morning hours, and as the valley floor begins to warm, the wind shifts to an up-valley direction and the speed increases. Afternoons are generally characterized by moderate speed winds flowing up through the valley which die down and begin to shift again as the sun sets and the valley begins to cool.

The conditions simulated for the Duckwater, Nevada, area represent a case of flow reversal. In the morning mountain drainage winds were postulated to flow to the south, while in the afternoon the higher speed dominant northward regional flow of air was presumed to have established itself. Stability pattern was similar to that used in Delamar/Dry Lake.

For Delta, Utah, a simulation was made to emulate conditions under which the town of Delta would receive dust pollutants. The "normal" meteorological conditions for the area would generally result in only very low, if any, impact on the town. Thus, an unlikely pattern of eastward airflow from 0800 thru 1200 was modeled with low winds in the early hours picking up later in the morning.

Modeling results for Delamar/Dry Lake, Delta and Duckwater are presented in Table 5.1.3-2. The highest and second highest 24-hour concentrations are reported for each area, along with the appropriate cluster configuration, emission scenario

Table 5.1.3-2. Fugitive dust concentrations resulting from construction (24 hour average values).

LOCATION	HIGHEST CONCENTRATION	SECOND HIGHEST CONCENTRATION
	MICROGRAM/CUBIC METER	MICROGRAM/CUBIC METER
Delamar/ Dry Lake	84	43
Delta	59	36
Duckwater	88	55

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*Average concentrations for 24 hours were obtained by adding the hourly concentrations which occurred during construction to a constant background level due to wind erosion. Utah's primary 24-hour standard for TSP is 260 $\mu g/m^3$. Nevada's primary 24-hour standard for TSP is 150 $\mu g/m^3$.

and location. The given grid cell indices correspond to those shown in Figures 5.1.1-1, 5.1.1-2, 5.1.1-3, and 5.1.1-4. The results are based on a 12-hour simulation for Delamar/Dry Lake, and on 4 (worst) hour simulations for Duckwater and Delta.

The highest concentration reported for each of the three areas occurs in the immediate vicinity of the batching and aggregate storage facilities (the major stationary emission source). The second highest levels result from shelter and road construction, and are more representative of the fugitive dust concentrations at locations near the heavy construction. The town of Delta received a maximum concentration of 25 micro-grams per cubic meter and was the only city affected by any of the simulations. The data in Table 5.1.3-2 shows that under the conditions modeled there would be no violation of any applicable 24-hour air quality standard. TSP NAAQS are shown in Table 5.1.3-3. Surface plots showing the construction scenarios and the distribution of the hourly particulate concentrations for the areas modeled are presented in Section 5.1.5.

These results may be viewed as conservative due to the fact that, once emitted, all particulate material was assumed to remain suspended for the remainder of the simulation period, when in reality some resettling of material would occur (Ref: EPA Guideline for Development of Control Strategies in Areas with Fugitive Dust Problems, October, 1977). The assumption of continuous suspension yields artificially high emission rates, hence conservative model results.

It should be noted that the concentrations reported by the IMPACT model are values averaged over a 4 kilometer by 4 kilometer area (one grid cell), hence higher levels than those reported for an entire grid cell would occur directly adjacent to areas of high construction activity within the grid cell. It is probable that within 100 meters of a construction site the particulate concentrations would exceed established air quality standards, even with maximum mitigation. During construction, the only personnel in the immediate vicinity of the construction would be those associated with the project, and they may be equipped with dust filters for health protection.

The IMPACT model is adequate for assessing concentrations on a regional scale, and the results are as good as may be expected, given the lack of site specific meteorological data and refined emissions scenarios.

The only fugitive dust emissions in a deployment area during normal operation will be due to wind erosion and vehicular traffic necessary for system security and maintenance. Emissions due to wind erosion will be at or near naturally occurring background levels once soil disturbance due to construction activities cease. Entrainment of dust caused by vehicles moving over the paved and unpaved roads of the deployment area is not expected to be significant, due to the low level of traffic forecast for the normal operation of the system.

Gaseous Pollutant Impacts

Effects During Operation

The primary air quality concern during the operation of the OB will be the amount of increase in levels of CO, NO_x, and hydrocarbons (HC) due mainly to traffic, space heating/cooling, and fuel storage. Carbon monoxide is a good indicator of the vehicle emissions, NO_x levels are representative of a more general class of emitters including both vehicles and space heating, and HC is an

Table 5.1.3-3. Applicable ambient air quality standards.

POLLUTANT	AVERAGING TIME	NAAQS*		NEVADA STANDARDS
		PRIMARY	SECONDARY	PRIMARY
Total Suspended Particulate Matter	Annual (Geometric Mean)	75 $\mu g/m^3$	60 $\mu g/m^3$[a]	75 $\mu g/m^3$
	24-hour[b]	260 $\mu g/m^3$	150 $\mu g/m^3$	150 $\mu g/m^3$

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*All Utah standards are equivalent to NAAQS.

[a]Secondary annual TSP standard (60 $\mu g/m^3$) is a guide for assessing State Implementation Plans.

[b]Not to be exceeded more than once per year.

evaporative product of fuel storage. Emissions of NO_x and HC are important as precursors to the formation of photochemical oxidants, however, a direct analysis of the potential of these OB emissions leading to oxidant formation was not possible due to lack of specific data on HC levels. Based on rough estimates of total NO_x emissions, it is possible that photochemical oxidant could be formed given a sunny day, a stable atmosphere, low wind speeds, and a sufficient amount of reactive hydrocarbons. However, it is not possible to quantify the effect at this time. Analyses of SO_x and TSP emissions were also neglected because no major sources of these pollutants were identified and their overall effect is expected to be negligible.

For general operational emissions, the IMPACT model was run for two gaseous pollutants, CO and NO_x. The potential OB sites of Beryl, Coyote Spring, and Ely were selected for modeling. Due to topographical and meteorological similarities between the Beryl site and the sites of Milford and Delta, the dispersion modeling results obtained for Beryl and vicinity were considered as adequate to describe potential air quality impacts of equivalent activity increases for Milford or Delta.

The emission levels for each of the OB sites were scaled from available emissions data gathered at Vandenberg Air Force Base, and distributed to appropriate locations on the expected operations base configurations (see Section 5.1.1). Vandenberg Air Force Base was deemed as being adequately representative of a typical OB site in terms of facilities, population, and types of operations. Some modifications to base layouts have occurred since the time of modeling, but the changes are not expected to significantly alter the concentration results since large grid squares, 4,000 feet by 4,000 feet are being used by the IMPACT model for this level of analysis.

The IMPACT model results show that CO reached peak hourly concentrations of 2.3, 1.6, and 2.5 parts per million (ppm) for Beryl, Coyote Spring, and Ely respectively, (see surface plots in Section 5.1.5). These CO maximum hourly values are well below the federal, Nevada, and Utah standards and no significant adverse impacts are therefore anticipated.

Maximum one-hour NO_x concentrations predicted by the model were 0.18, 0.20, and 0.13 ppm for Beryl, Coyote Spring, and Ely (see surface plots in Section 5.1.5). These values are greater than the federal, Nevada, or Utah annual standard of 0.05 ppm, however, the one-hour peak value is of short duration and not expected to be of sufficient magnitude to contribute to an exceedance of the overall annual level. Information on long-term emission rates will be required to confirm this expected lack of long-term significant impact.

The peak values of both CO and NO_x occurred during the early morning hours between 7:00 a.m. and 10:00 a.m., when light winds and stable atmospheric conditions result in poor pollutant dispersion. The emissions of SO_x and HC are less in magnitude than those of either CO or NO_x during any hour of the day. Since no violations of the standards are predicted for CO, the same conclusion is expected for SO_x and HC.

PREDICTED POLLUTANT CONCENTRATIONS - TEXAS/NEW MEXICO (5.1.4)

Construction areas from Texas/New Mexico which were either representative of a large set of construction groups, or were located close to population centers, were selected for air quality modeling.

Construction groups near Clovis, New Mexico, and Dalhart and Hereford, Texas, were selected for study in the Texas/New Mexico DDA. A construction time period when the highest dust emission rates are produced is assumed in the model. In the linear configuration, all construction groups have identical total emission rates because of an identical number of clusters included. The most intensive construction activity time period occurs when cluster road construction proceeds within five cluster areas, shelter construction occurs within five clusters and three clusters are completed. A construction camp with corresponding stationary sources are planned for operation at each construction group.

The areas modeled in the Texas/New Mexico deployment area (Hereford, Clovis, and Dalhart) are areas of similarly flat terrain. Due to the characteristically flat terrain, significant cold air drainage winds, common in the valley areas of Nevada/Utah, do not occur in the Texas/New Mexico study area. Thus, the wind fields of both morning and afternoon are uniform throughout the study region, generally exhibiting a flow towards the ENE. Morning wind speeds for the hours 0800-1000 were approximately 2 m/sec, and the late morning winds increase to average speeds of 6 m/sec. Ground level inversions were assumed for 0800 and 0900. At 1000 hr, the inversion rose above 100 m; and at 1100 hr, the atmosphere was presumed to have become entirely neutral. Meteorological conditions modeled were selected for the Hereford, Texas area and for both Dalhart, Texas and Clovis, New Mexico (see Section 4.2.2).

Modeling results for Clovis, Hereford, and Dalhart are presented in Table 5.1.4-1. The highest and second highest concentrations are reported for each area. The 24-hr concentrations are based on the results of a 4-hour simulation done for each area.

The highest concentration reported for each of the three areas occurs in the immediate vicinity of their respective batching and aggregate storage facilities (the major stationary emission source). The second highest levels result from shelter and road construction and are more representative of the fugitive dust concentrations at locations near heavy construction sites. Under the conditions modeled there would be no violation of any applicable 24-hour air quality standard (Table 5.1.4-2). These results may be viewed as conservative, because after emission, all particulate material was assumed to remain suspended for the remainder of the simulation period. In reality, some resettling of material would occur. (Reference: EPA Guideline for Development of Control Strategies in Areas with Fugitive Dust Problems, October, 1977). The assumption of continuous suspension yields artificially high emission rates and correspondingly conservative model results.

Concentrations reported by the IMPACT model are values averaged over a 4 km by 4 km area (one grid cell). Higher levels than those reported for an entire grid cell would normally occur directly adjacent to areas of high construction activity within the grid cell. It is probable that within 100 m of a construction site the particulate concentrations would exceed established air quality standards, even with maximum mitigation. During construction, the only personnel in the immediate vicinity of the construction would be those associated with the project, and they should be equipped with dust filters for health protection.

The IMPACT model is adequate for assessing concentrations on a regional scale, and the results are adequate for analysis, given the lack of site-specific meteorological data and refined emissions scenarios.

Table 5.1.4-1. Fugitive dust concentrations resulting from construction (24-hour average values).

LOCATION	HIGHEST CONCENTRATION	SECOND HIGHEST CONCENTRATION
	MICROGRAM/CUBIC METER	MICROGRAM/CUBIC METER
Clovis	50	38
Dalhart	54	35
Hereford	72	64

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*Average concentrations for 24 hours were obtained by adding the hourly concentrations which occurred during construction to a constant background level due to wind erosion. Texas' and New Mexico's 24-hour standard for TSP is 150 $\mu g/m^3$.

Table 5.1.4-2. Summary of National Ambient Air Quality Standards (NAAQS) and New Mexico and Texas ambient air quality standards.

POLLUTANT	AVERAGING TIME	NAAQS		TEXAS STANDARDS	NEW MEXICO STANDARDS
		PRIMARY	SECONDARY		
Total Suspended Particulate Matter	Annual (Geometric Mean)	75 $\mu g/m^3$	60 $\mu g/m^3$ [1]	Same as NAAQS	60 $\mu g/m^3$
Total Suspended Particulate Matter	24-hour[2]	260 $\mu g/m^3$	150 $\mu g/m^3$	150 $\mu g/m^3$	150 $\mu g/m^3$
Total Suspended Particulate Matter	1-hour[3]	–	–	400 $\mu g/m^3$	N/A
Total Suspended Particulate Matter	3-hour[3]	–	–	200 $\mu g/m^3$	N/A
Total Suspended Particulate Matter	5-hour[3]	–	–	100 $\mu g/m^3$	N/A
Lead	Quarterly (Arithmetic Mean)	1.5 $\mu g/m^3$	–	Same as NAAQS	Same as NAAQS
Carbon Monoxide	8-hour[2] 1-hour[2]	10 mg/m^3 (9 ppm) 40 mg/m^3 (35 ppm)	Same as Primary Standards	Same as NAAQS	97 mg/m^3 (8.7 ppm) 15 mg/m (13.1 ppm)
Carbon Monoxide Above 5,000 ft MSL	8-hour[2] 1-hour[2]	10 mg/m^3 (9 ppm) 40 mg/m^3 (35 ppm)			
Ozone	1-hour[4]	235 $\mu g/m^3$ (0.12 ppm)	Same as Primary Standard	Same as NAAQS	118 $\mu g/m^3$ (0.06 ppm)
Nitrogen Dioxide	Annual (Arithmetic Mean)	100 $\mu g/m^3$ (0.05 ppm)	Same as Primary Standard	Same as NAAQS	
Hydrocarbons (Corrected for Methane)	3-hour (6-9 a.m.)	160 $\mu g/m^3$	Same as Primary Standard	Same as NAAQS	
Sulfur Dioxide	Annual (Arithmetic Mean) 24-hour[2] 3-hour[2]	80 $\mu g/m^3$ (0.03 ppm) 365 $\mu g/m^3$ (0.14 ppm) None	Same as Primary Standard 1,300 $\mu g/m^3$ (0.5 ppm)	Same as NAAQS	52 $\mu g/m^3$ (0.02 ppm) 26 $\mu g/m^3$ (0.10 ppm) Same as NAAQS

769-1

[1]Secondary annual NAAQS TSP standard (60 $\mu g/m^3$) is a guide for assessing state implementation plans.

[2]Not to be exceeded more than once per year.

[3]Not to be exceeded any time by any single major stationary source or group of sources located on contiguous property.

[4]The ozone standard is attained when the expected number of days per calendar year with a maximum hourly average concentration above the standard is equal to or less than one.

The only fugitive dust emissions in individual deployment areas during normal operation will be due to wind erosion and vehicular traffic necessary for system security and maintenance. Emissions due to wind erosion will be at or near naturally occurring background levels once the soil disturbances due to construction activities cease. Entrainment of dust caused by vehicles moving over the paved and unpaved roads of the deployment area is not expected to be significant, due to the low level of traffic forecast for the normal operation of the system.

Gaseous Emissions

Gaseous emissions resulting from construction or operation of the M-X system are not expected to cause significant deterioration of existing air quality in the Texas/New Mexico deployment area. The major gaseous emissions which would be of concern are carbon monoxide, nitrogen oxides, sulfur dioxide, and hydrocarbons. These criteria pollutants would be emitted mainly during fuel combustion processes. Heavy-duty vehicles and generators burning diesel fuel would be the largest source of emissions for the construction phase of the project. Private vehicles and space heating/cooling units would be the major emitters during systems operation.

The IMPACT model was used to model regional dispersal of CO and NO_x around the Clovis, New Mexico operating base site. Due to topographical and meteorological similarities between the Clovis site and the Dalhart, Texas, operation base site, the modeling results obtained for Clovis and vicinity were considered as adequate to describe potential air quality impacts of equivalent activity increases at Dalhart.

The emission levels for each of the OB sites were scaled from data gathered at Vandenberg Air Force Base and redistributed to appropriate locations on the expected operations base configurations (see Section 5.1.1).

The IMPACT model results show that CO reached a peak hourly concentration of 1.3 ppm (see surface plots in Section 5.1.5). This maximum hourly value for CO is well below the federal, Texas, and New Mexico standards and no significant adverse regional impact is therefore expected.

The maximum one-hour NO_x concentration predicted by the model was 0.11 ppm, which, while greater in magnitude than the federal, Texas, or New Mexico annual standard of 0.05 ppm, is of short duration and not expected to lead to any long-term impacts. SO_x and HC emissions are less than either CO or NO_x, and since no violations of standards are predicted for CO, the same conclusion is expected for SO_x and HC.

SURFACE PLOTS (5.1.5)

The concentration levels predicted by the IMPACT model are shown on an hourly basis in the form of surface plots. The surface plots are schematic representations of the output results for each modeling site presented on the same grid as used for inputting the digitized terrain and the input emissions (see Sections 5.1.1 and 5.1.2). It is not possible to present topographic information as well as pollutant and construction data on the surface plots. Therefore, we recommend that the reader refer to the appropriate emission grid figure in Section 5.1.1 which includes the topographic and cultural information of the area modeled. Areas in which various modes of construction or system operation occur are outlined and shaded in according to an identifying legend given on the figure. Again, the construction configuration indicated on the figures and used in the model represent

a time period where the highest particulate emission rates are expected for that construction group. The numbers on the figure correspond to predicted incremental levels of pollutant concentration as also identified in the legend. The predictions are given on an hourly basis and values can be seen to change from hour to hour dependent mainly on the meteorologic conditions of wind and stability. In comparing the output results to the input hourly meteorological conditions it can be seen that the highest concentrations occur during the hours of low wind with a stable atmosphere, conditions which contribute to poor pollutant dispersal. Concentrations generally flow and build up along the predominant wind direction under conditions of a low, steady wind and high stability which prevent upward dispersal. High winds also blow pollutants along the direction of flow, but tend to disperse and dilute the pollutants thereby lowering concentrations.

The areas modeled for construction impacts exhibit the highest concentrations of particulates around the vicinity of the stationary sources and construction camp since this is an area of high activity and intense emission rates. The next highest area of concentation is associated with the part of the system which is undergoing construction of cluster roads and shelters simultaneously. Large numbers of vehicles are operating within this part of the system, but because of the large area in which they are spread out, the emission concentations are not as high as around the relatively small stationary source area with its high density of vehicles and activity. The lowest levels of pollutant concentration are found around the inactive areas of the system in which wind erosion from previously disturbed surfaces is the only source of emissions.

The modeling of the OB locations for gaseous pollutant concentrations demonstrated a similar pattern of levels for each site. The highest concentrations were found around the main gate areas of the OB, and the next highest levels were found spread out along the road connecting the support community and the base. These findings are quite reasonable in light of the fact that the majority of emissions are vehicle-related and the largest amounts of VMT will occur between the major population center and the main gate.

The surface plots of the construction modeled sites of Dry Lake/Delamar, Duckwater, Delta, Clovis, Dalhart, and Hereford are presented in Figures 5.1.5-1 through 5.1.5-56. Surface plots for the modeled OB sites of Ely, Beryl, Coyote Spring, and Clovis are given as Figures 5.1.5-57 through 5.1.5-84.

5.2 HIWAY

The EPA HIWAY line source model was used to predict gaseous pollutant concentrations associated with system construction and OB operation.

CONSTRUCTION

The largest gaseous emission rate during construction was found to be 8,000 lb/day (3,628 kg/day) for No_x. This 8,000 lb/day rate occurred in a cluster road construction area when one hundred percent of the allocated cluster road construction equipment was operating. Normally within a segment of operations the cluster road equipment is expected to be spread out over a work area of five cluster systems at any one time. However, for preliminary analysis it was assumed that all of the daily emissions would be concentrated within a working area encompassing only one cluster system; i.e., on a roadway system of approximately 35 mi (56 km). The emission rate per unit distance therefore becomes 229 lb/day/mi (104 kg/day/mi).

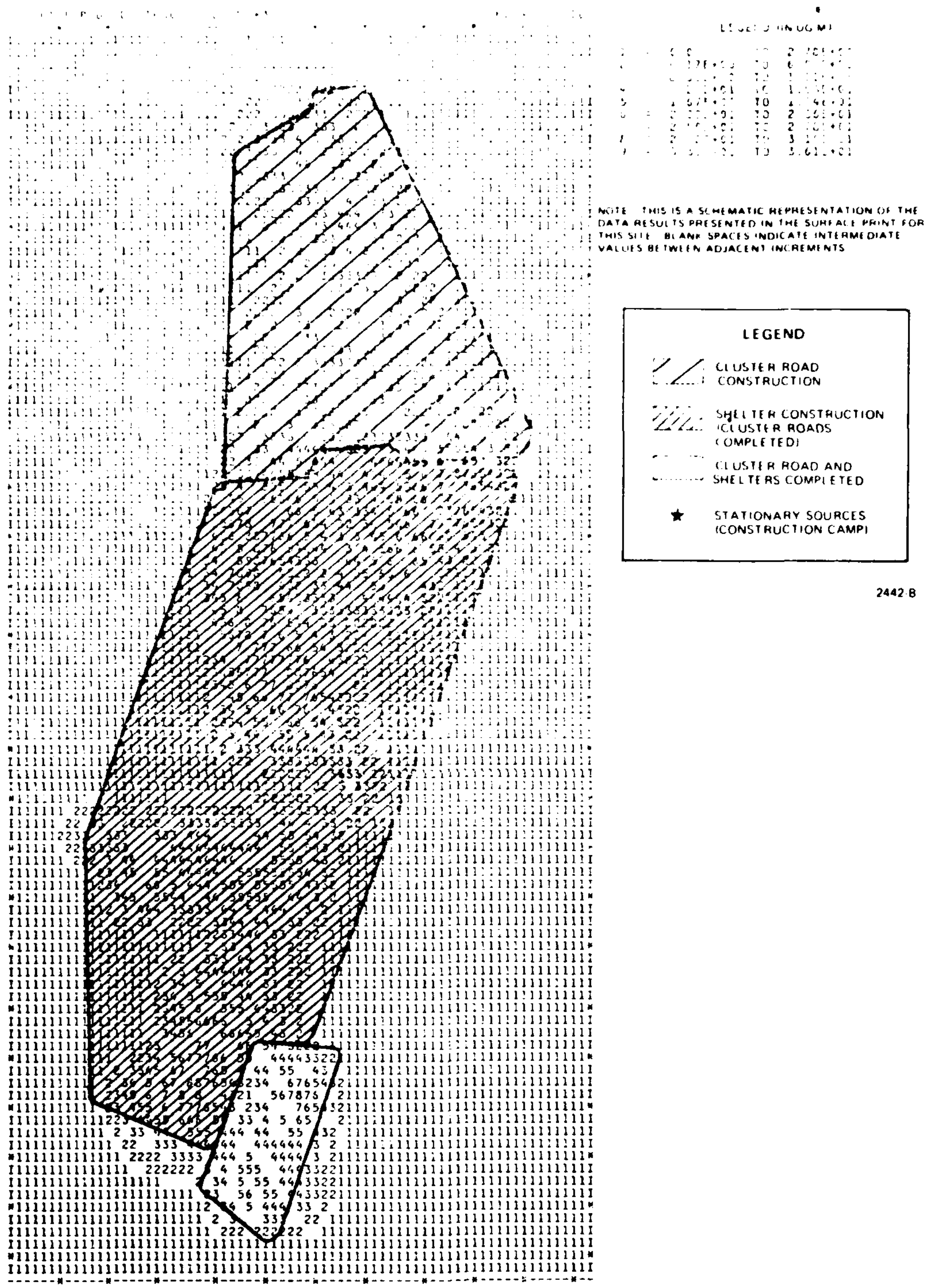


Figure 5.1.5-1. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads. Dry Lake/ Delamar Valleys: mitigated emissions for the linear system.

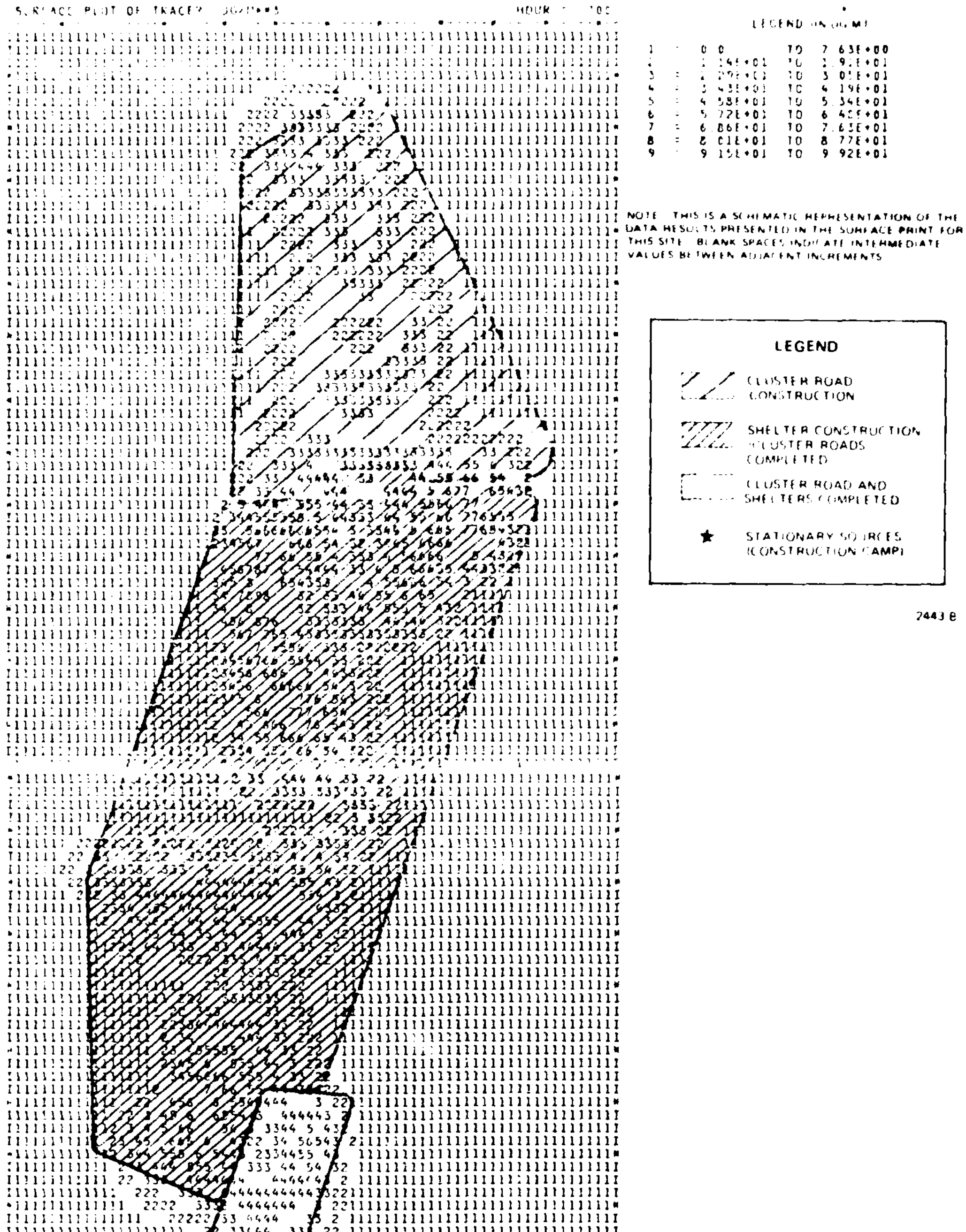


Figure 5.1.5-2. Predicted hourly particulate concentrations due to the construction of shelter and cluster roads. Dry Lake/ Delamar Valleys: mitigated emissions for the linear system.

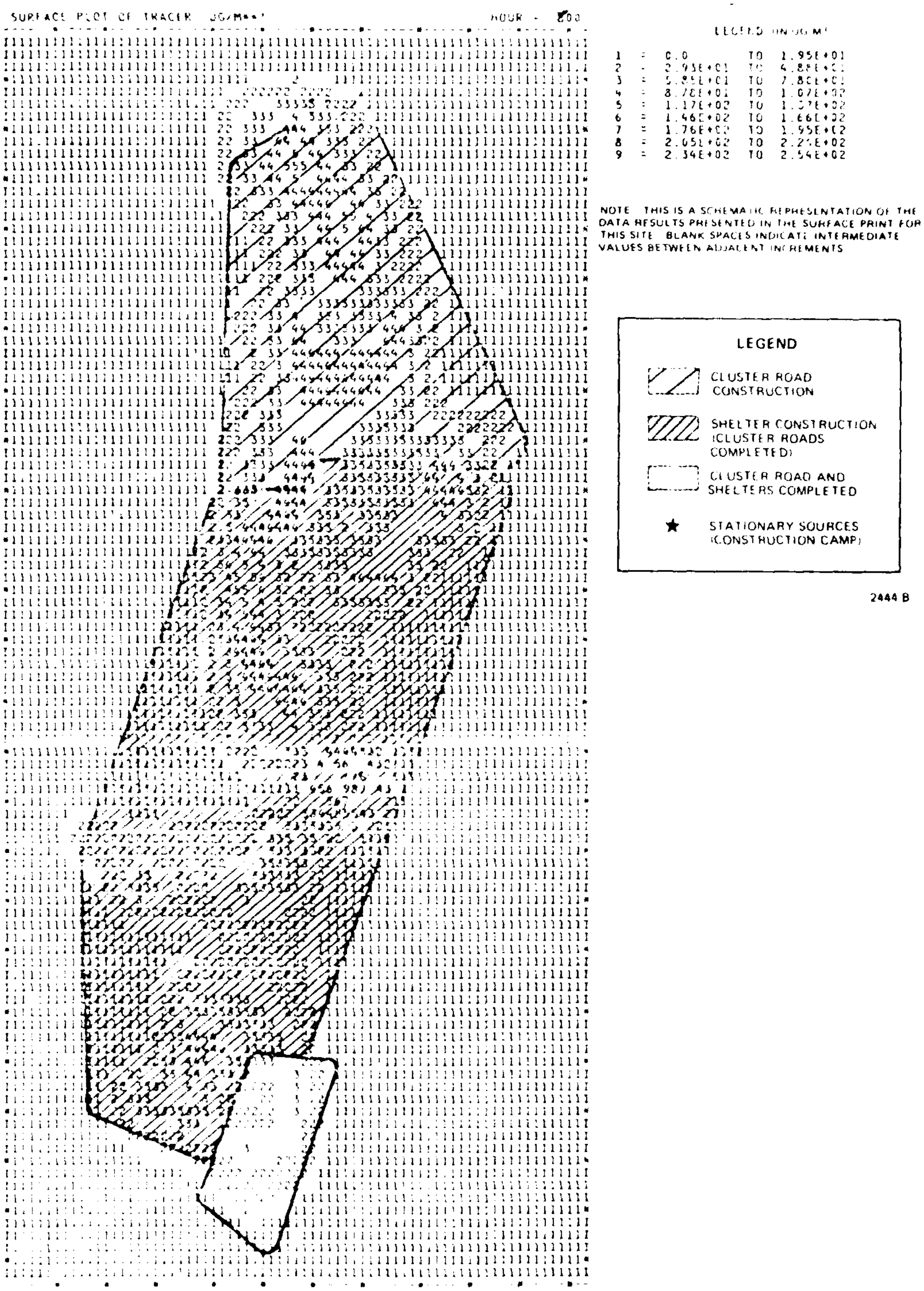


Figure [illegible]. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads. Dry Lake/Delamar Valleys: mitigated emissions to the linear system.

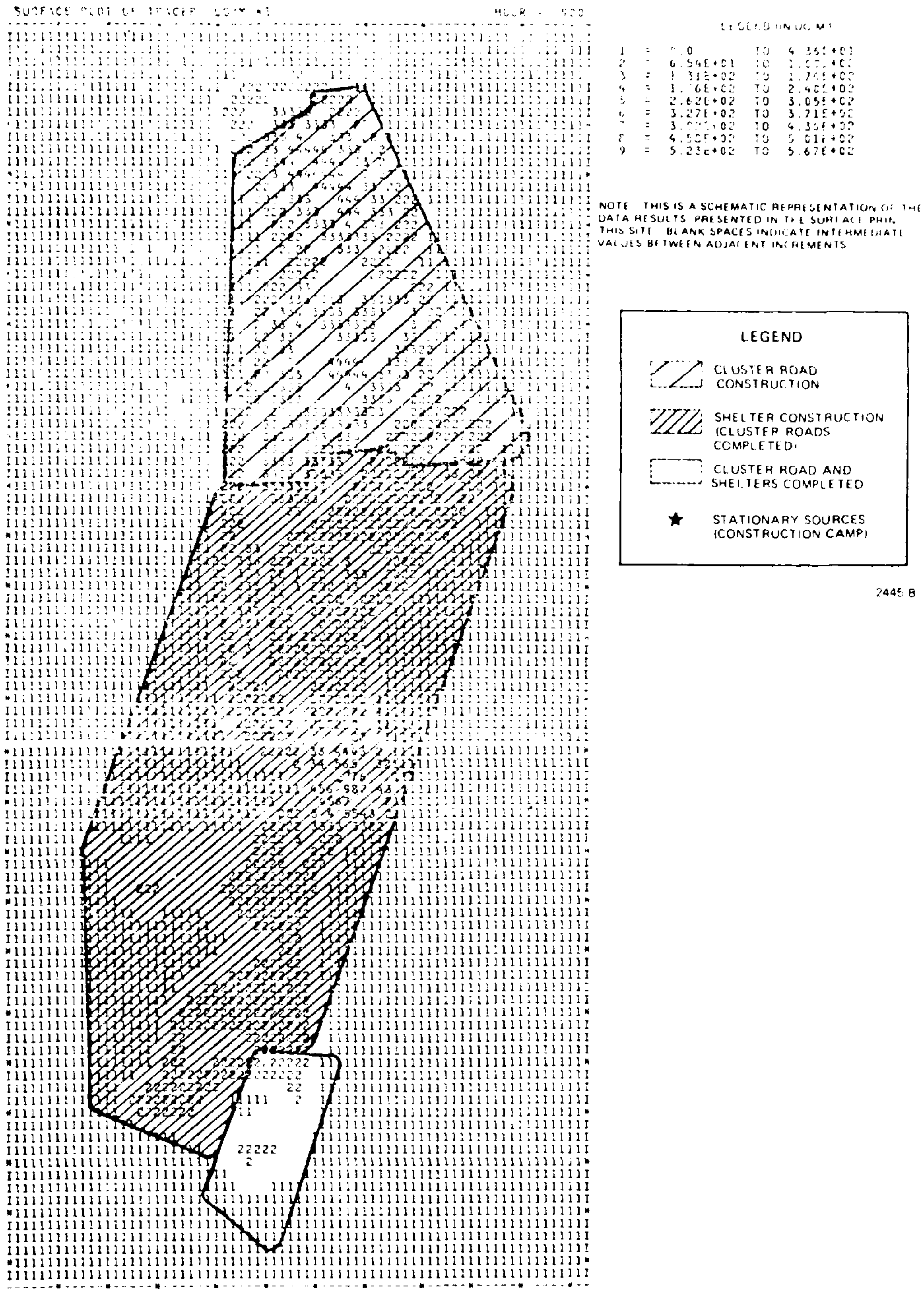


Figure 5.1.5-4. Predicted hourly particulate concentration due to the construction of shelters and cluster roads. Dry Lake/ Delamar Valleys: mitigated emissions for the linear system.

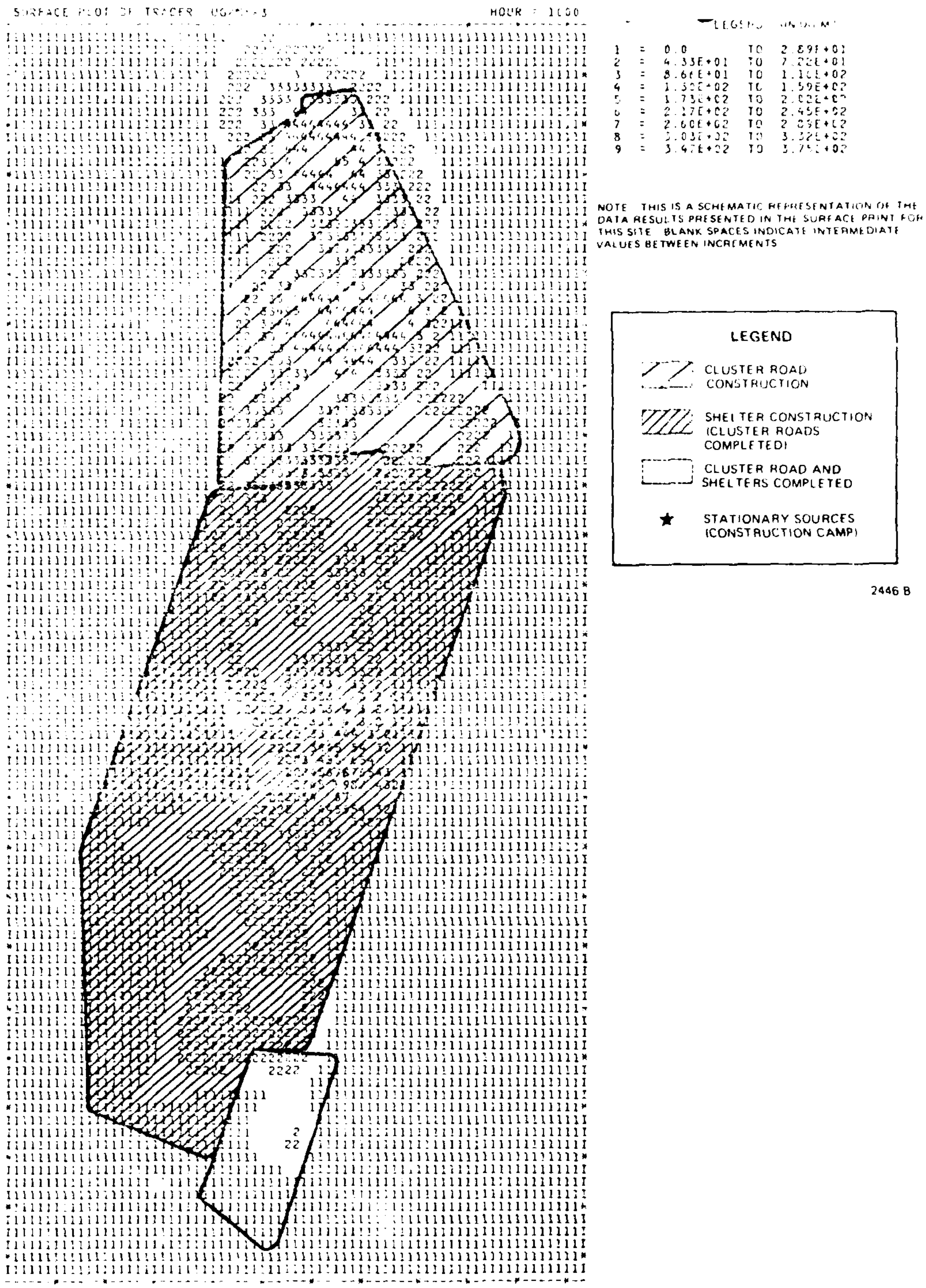


Figure 5.1.5-5. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads. Dry Lake/ Delamar Valleys: mitigated emissions for the linear system.

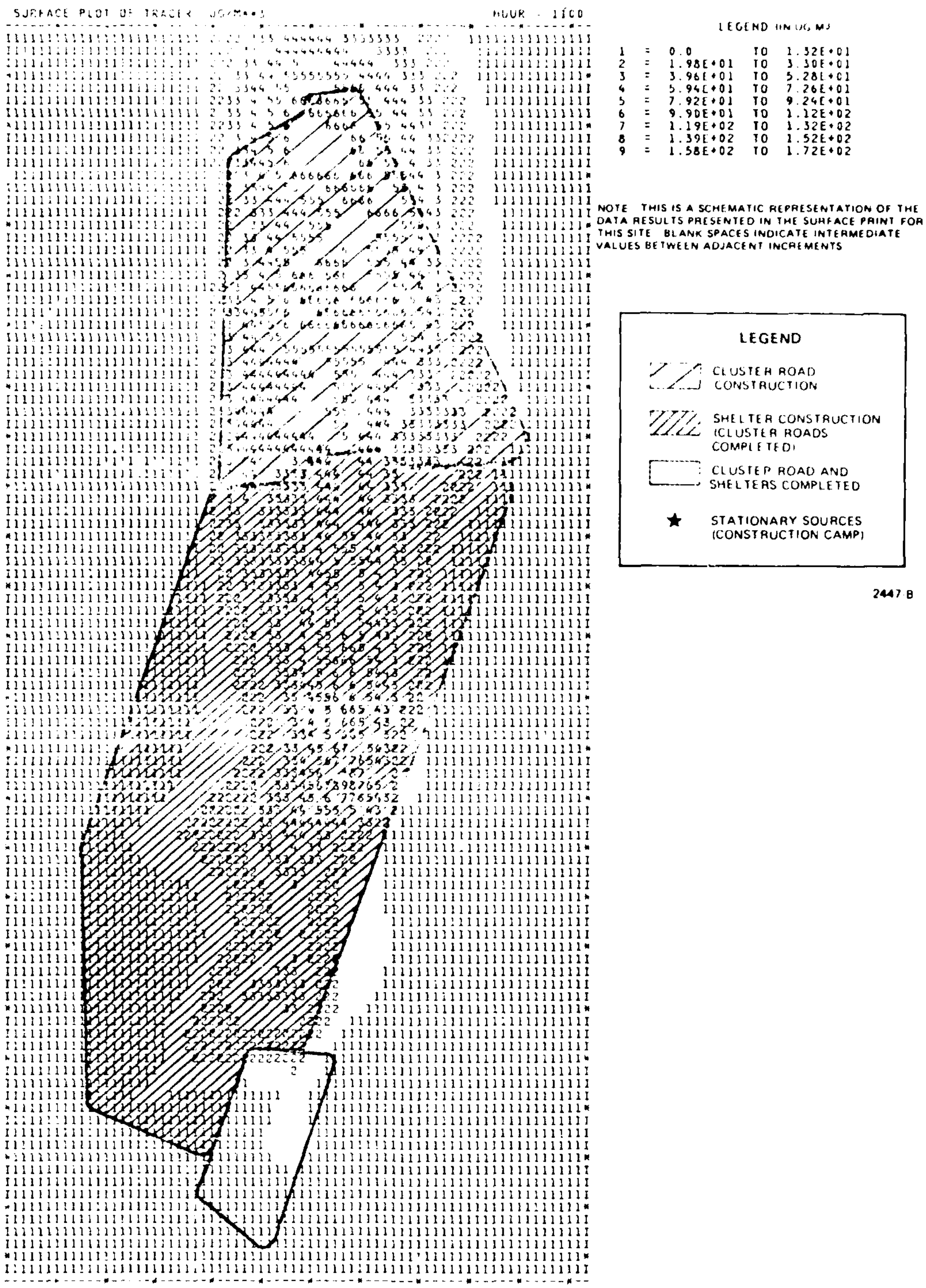


Figure 5.1.5-6. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads. Dry Lake/ Delamar Valleys: mitigated emissions for the linear system.

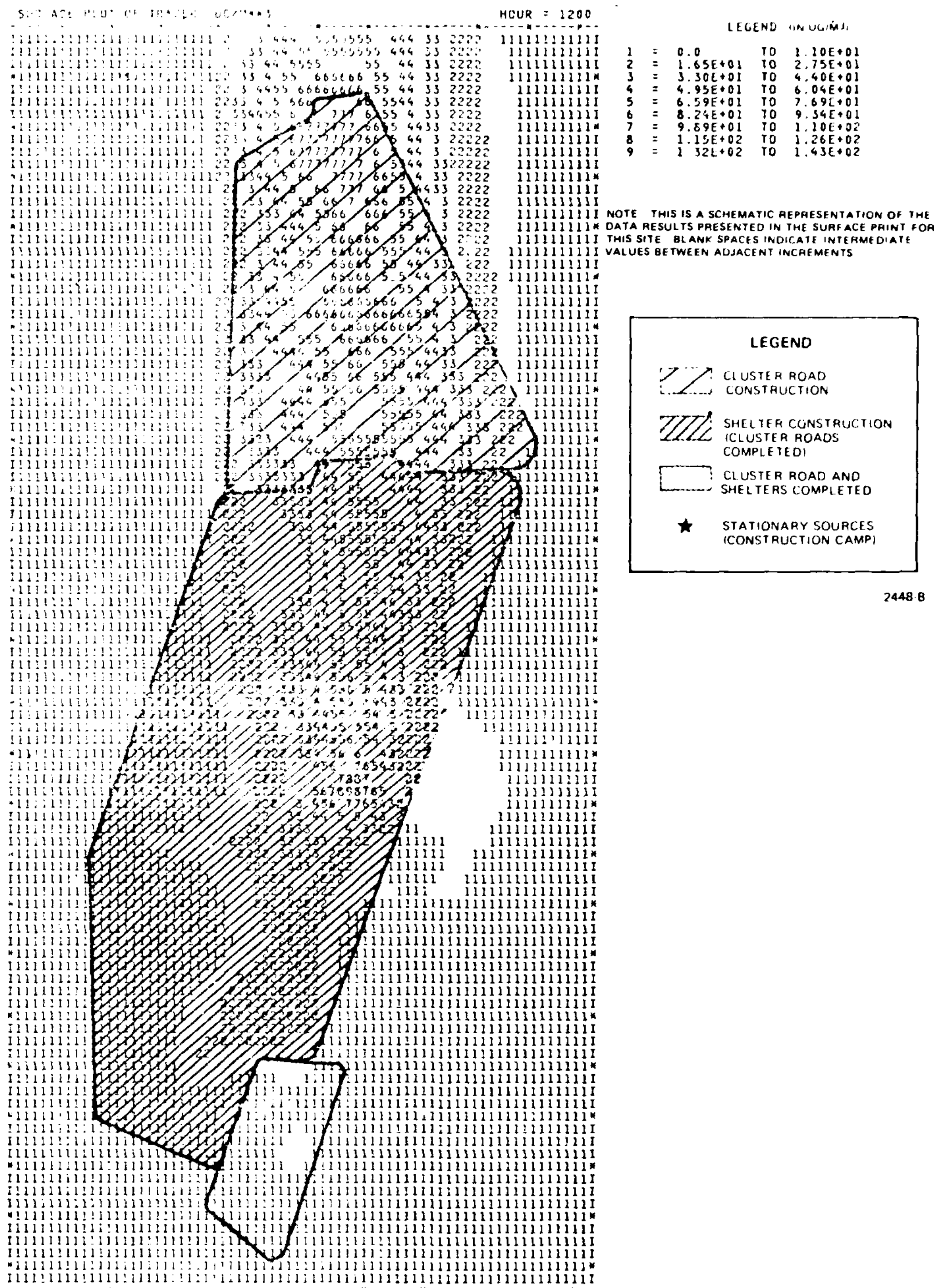


Figure 5.1.5-7. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads. Dry Lake/ Delamar Valleys: mitigated emissions for the linear system.

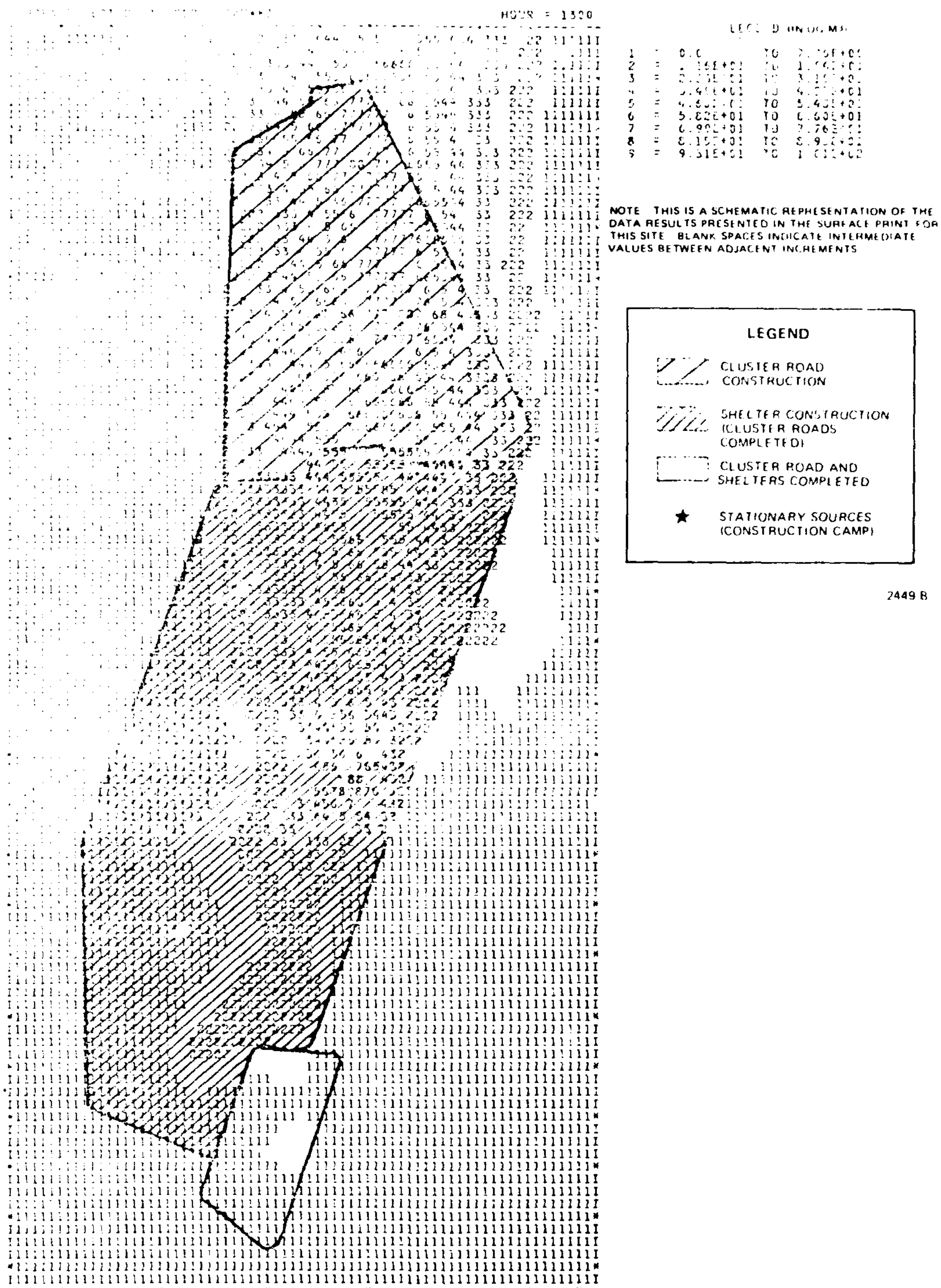


Figure 5.1.5-8. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads. Dry Lake/ Delamar Valleys: mitigated emissions for the linear system.

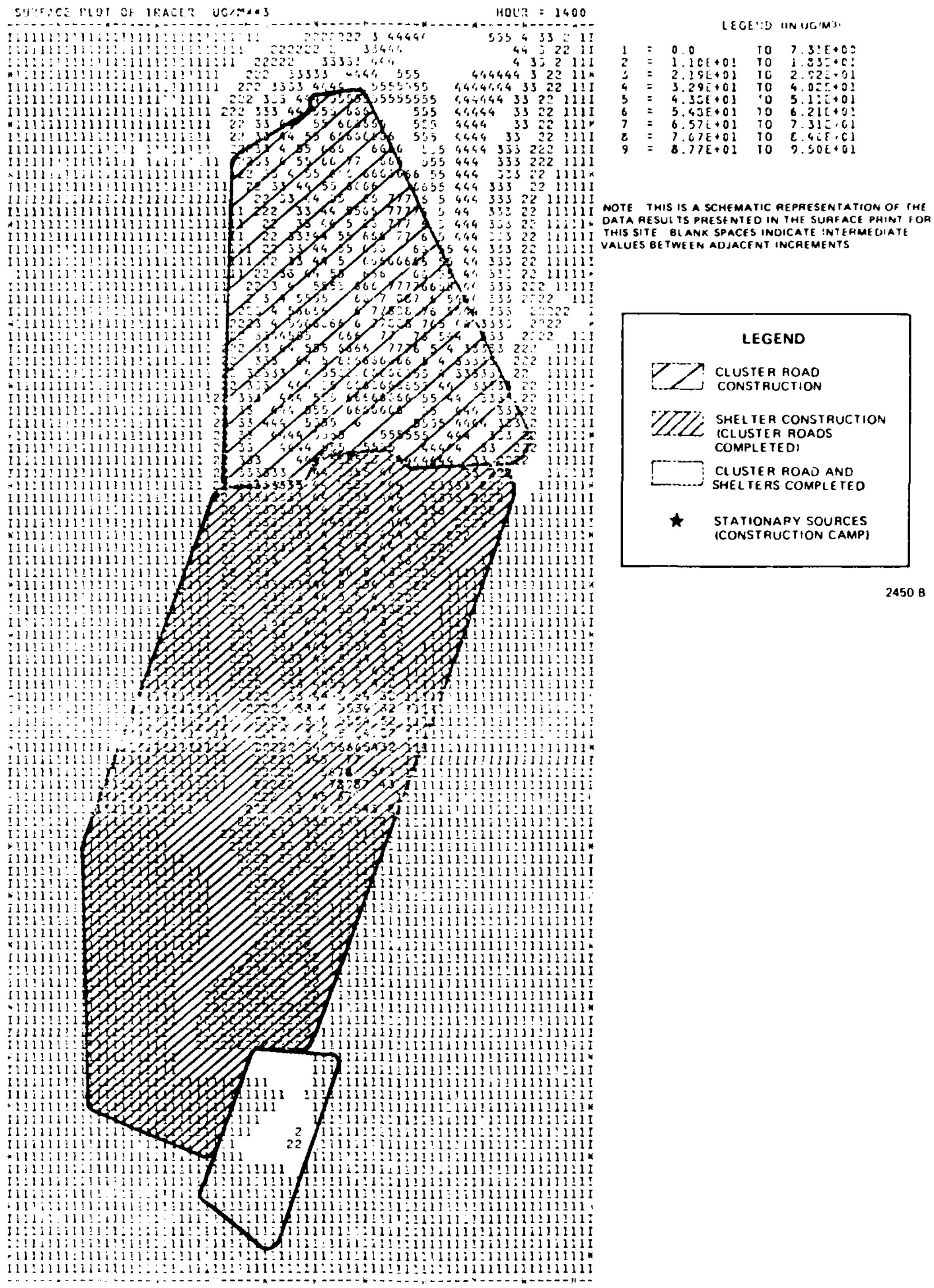


Figure 5.1.5-9. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads. Dry Lake/ Delamar Valleys: mitigated emissions for the linear system.

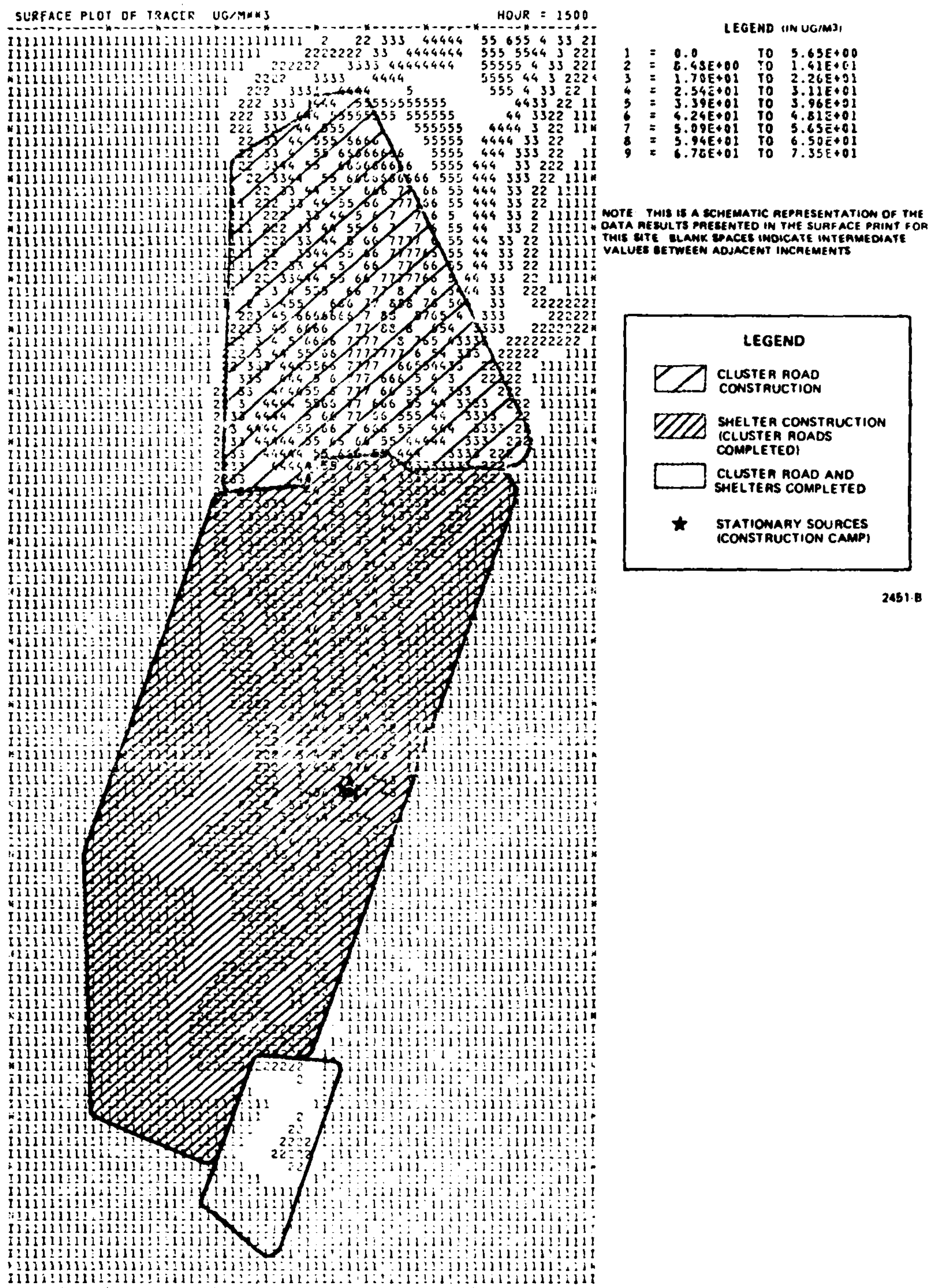


Figure 5.1.5-10. Predicted hourly concentrations due to the construction of shelters and cluster roads. Dry Lake/Delamar Valleys: mitigated emissions for the linear system.

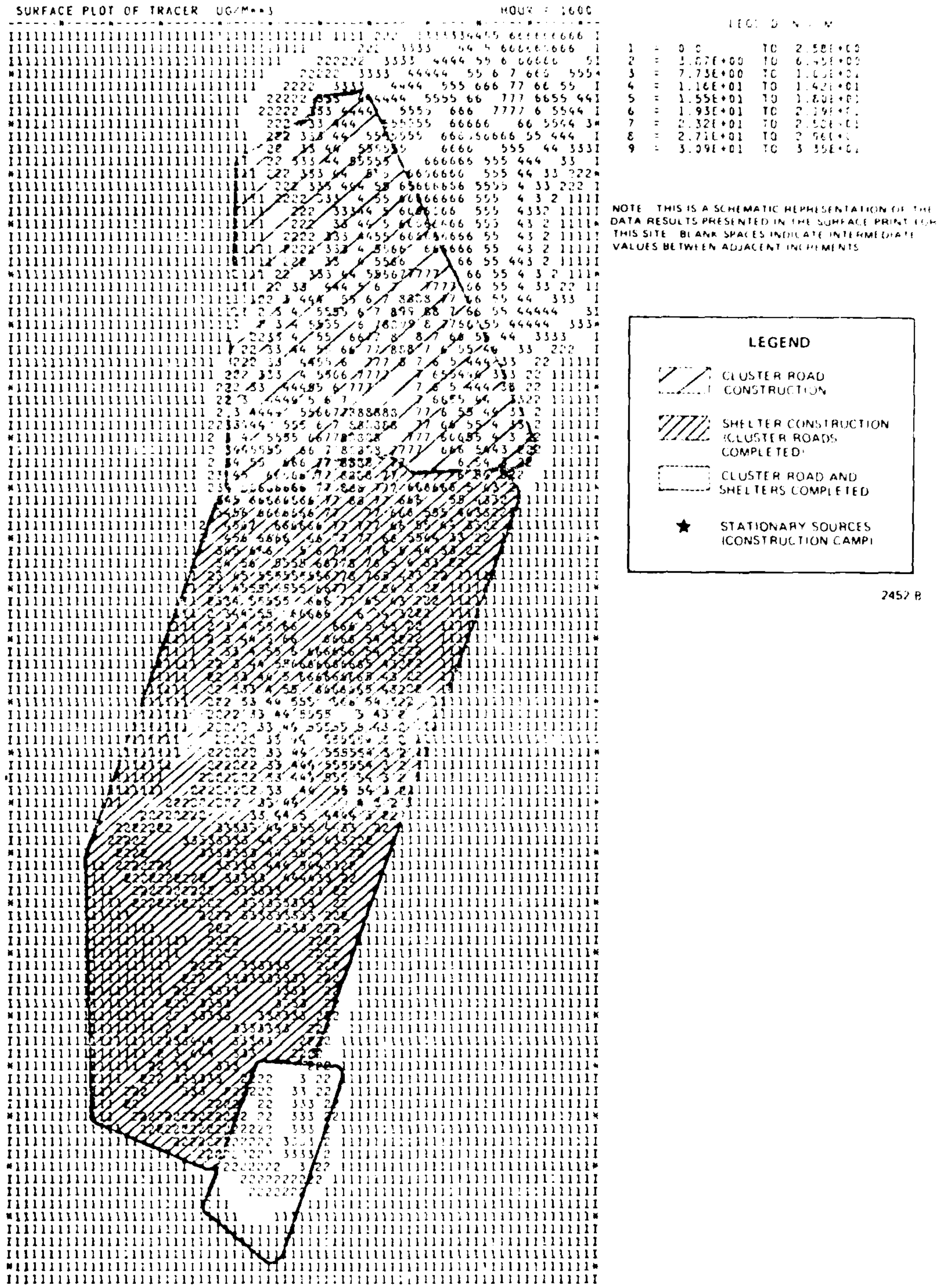


Figure 5.1.5-11. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads. Dry Lake/ Delamar Valleys: mitigated emissions for the linear system.

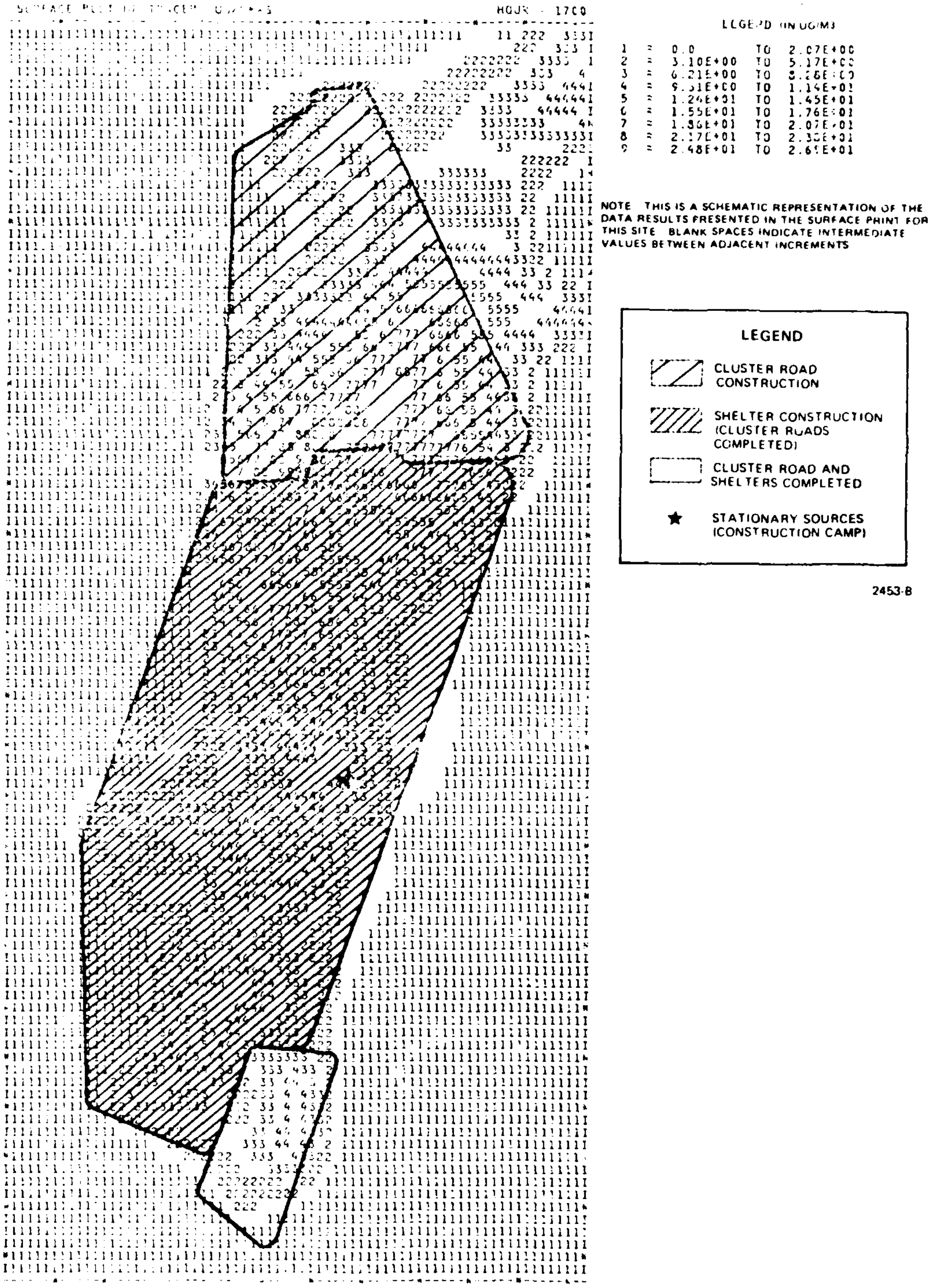


Figure 5.1.5-12. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads. Dry Lake/ Delamar Valleys: mitigated emissions for the linear system.

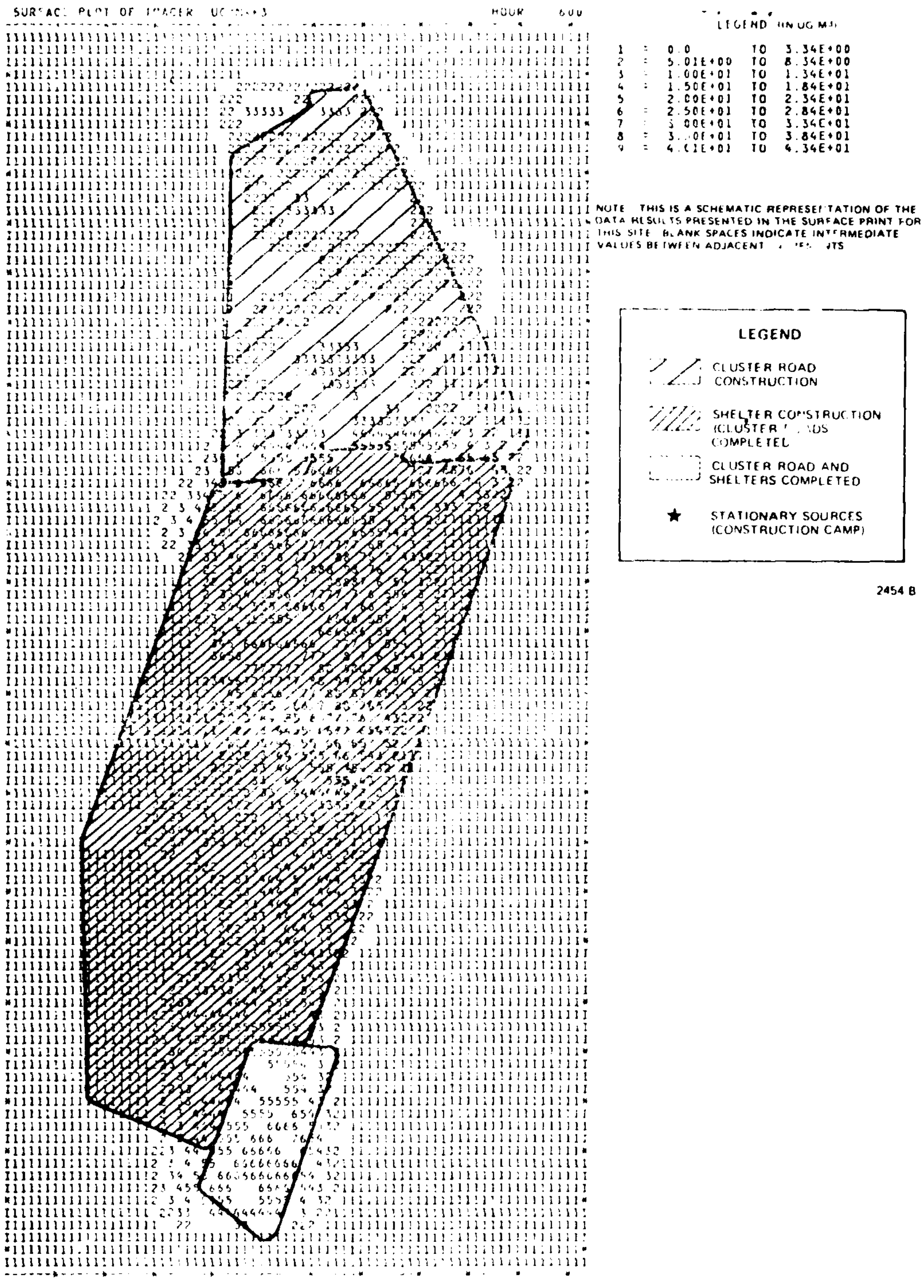


Figure 5.1.5-13. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dry Lake/Delamar Valleys: mitigated emissions for the loop system.

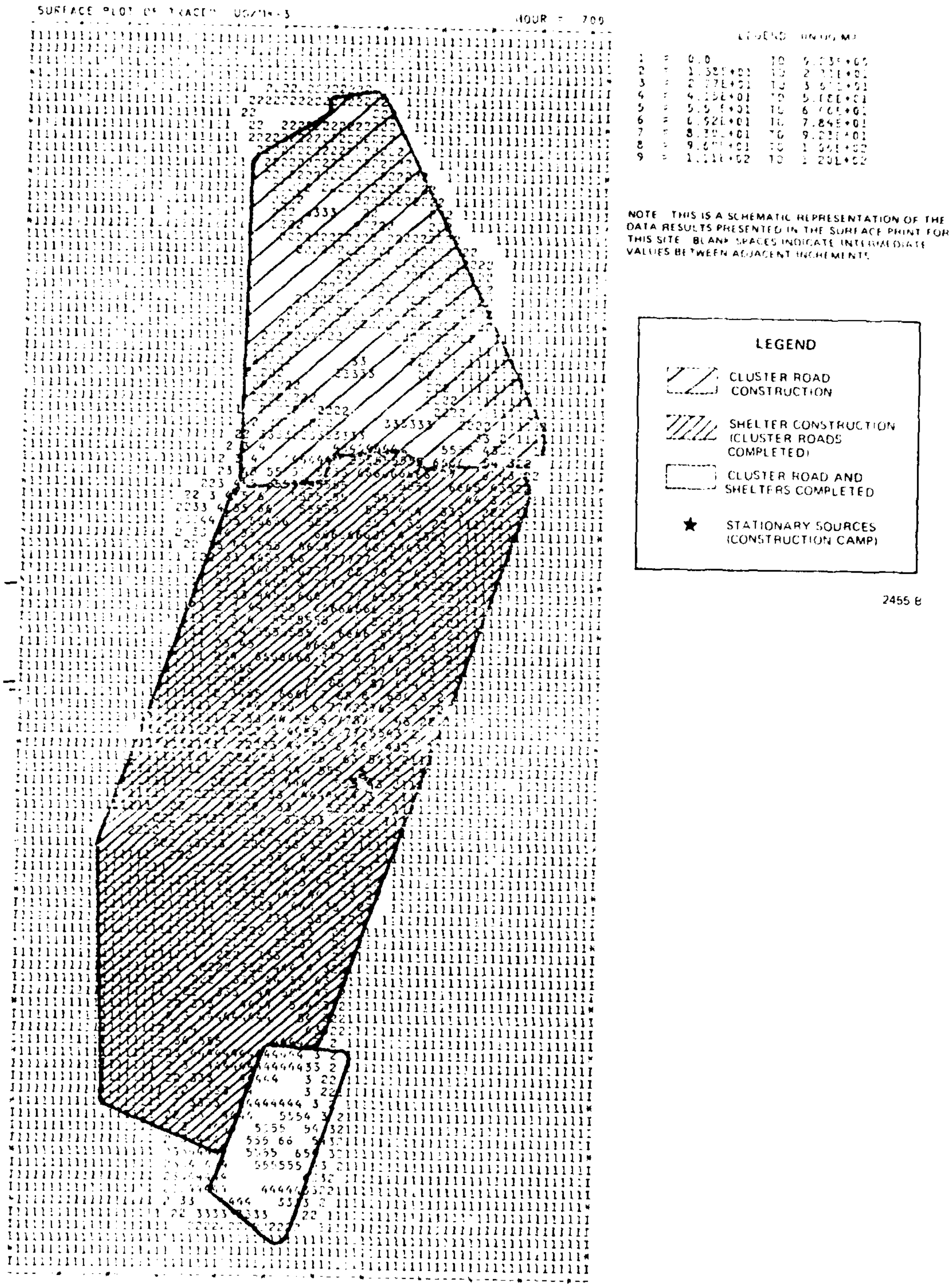


Figure 5.1.5-14. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dry Lake/Delamar Valleys: mitigated emissions for the loop system.

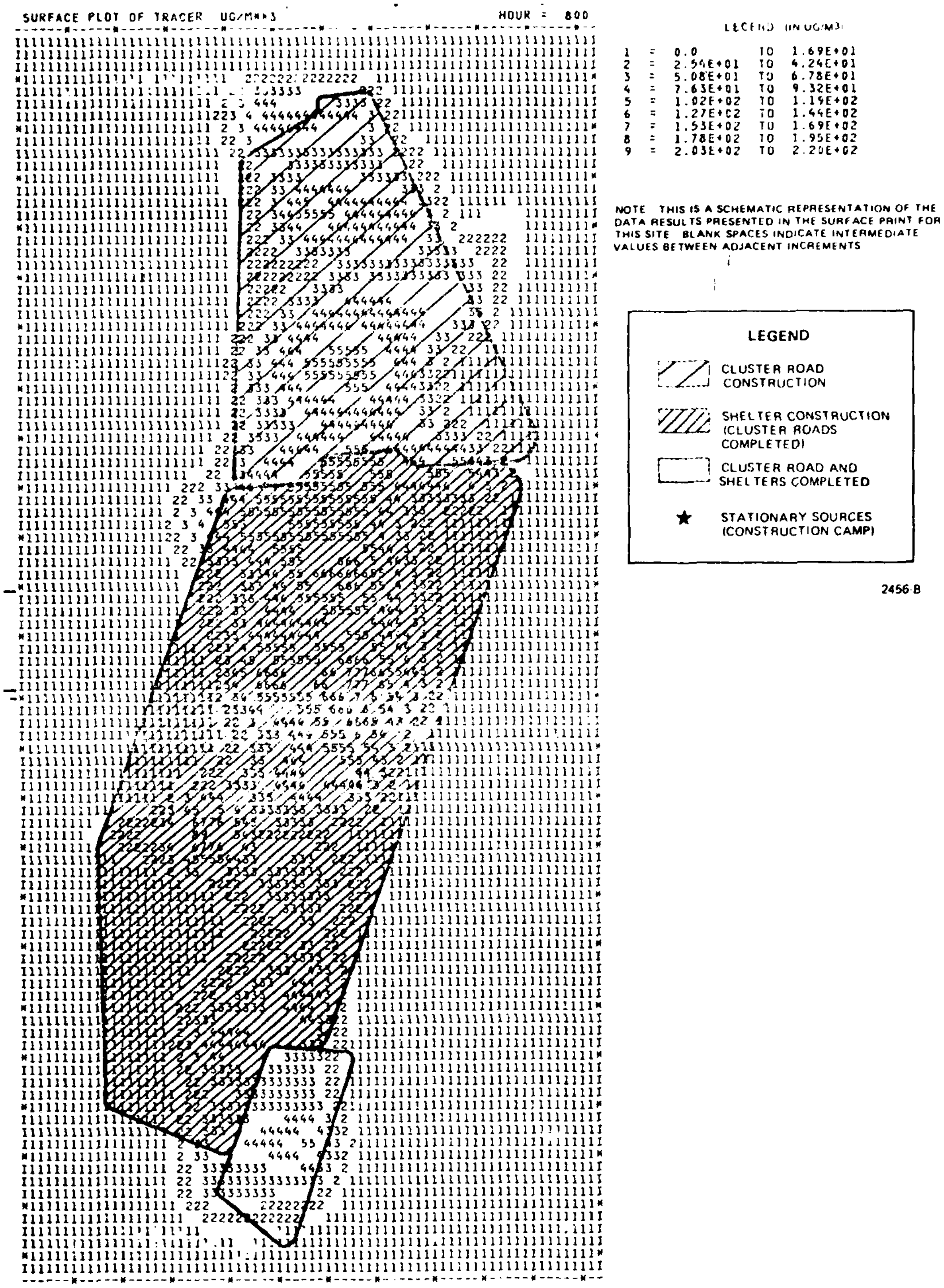


Figure 5.1.5-15. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dry Lake/Delamar Valleys: mitigated emissions for the loop system.

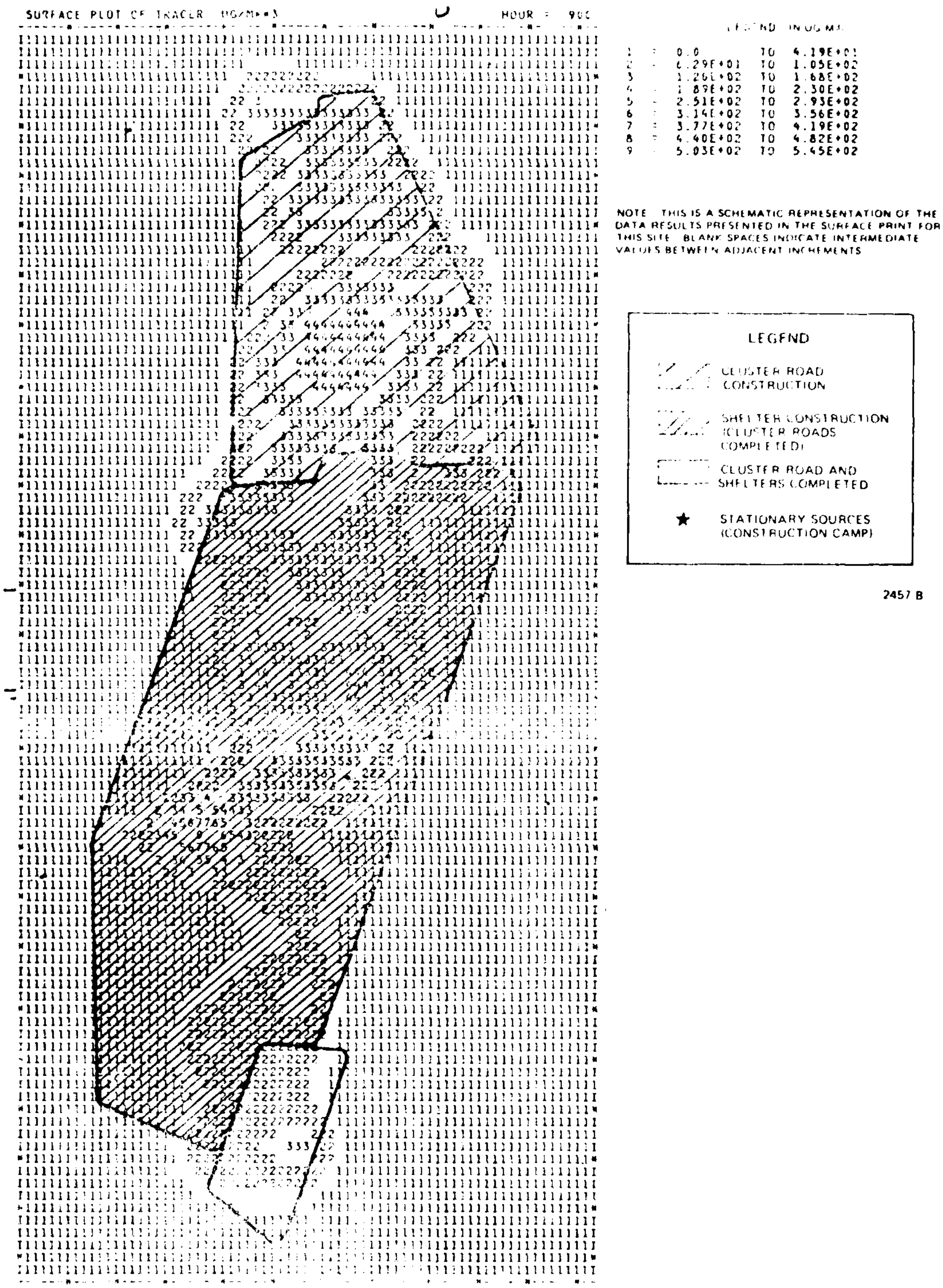


Figure 5.1.5-16. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dry Lake/Delamar Valleys: mitigated emissions for the loop system.

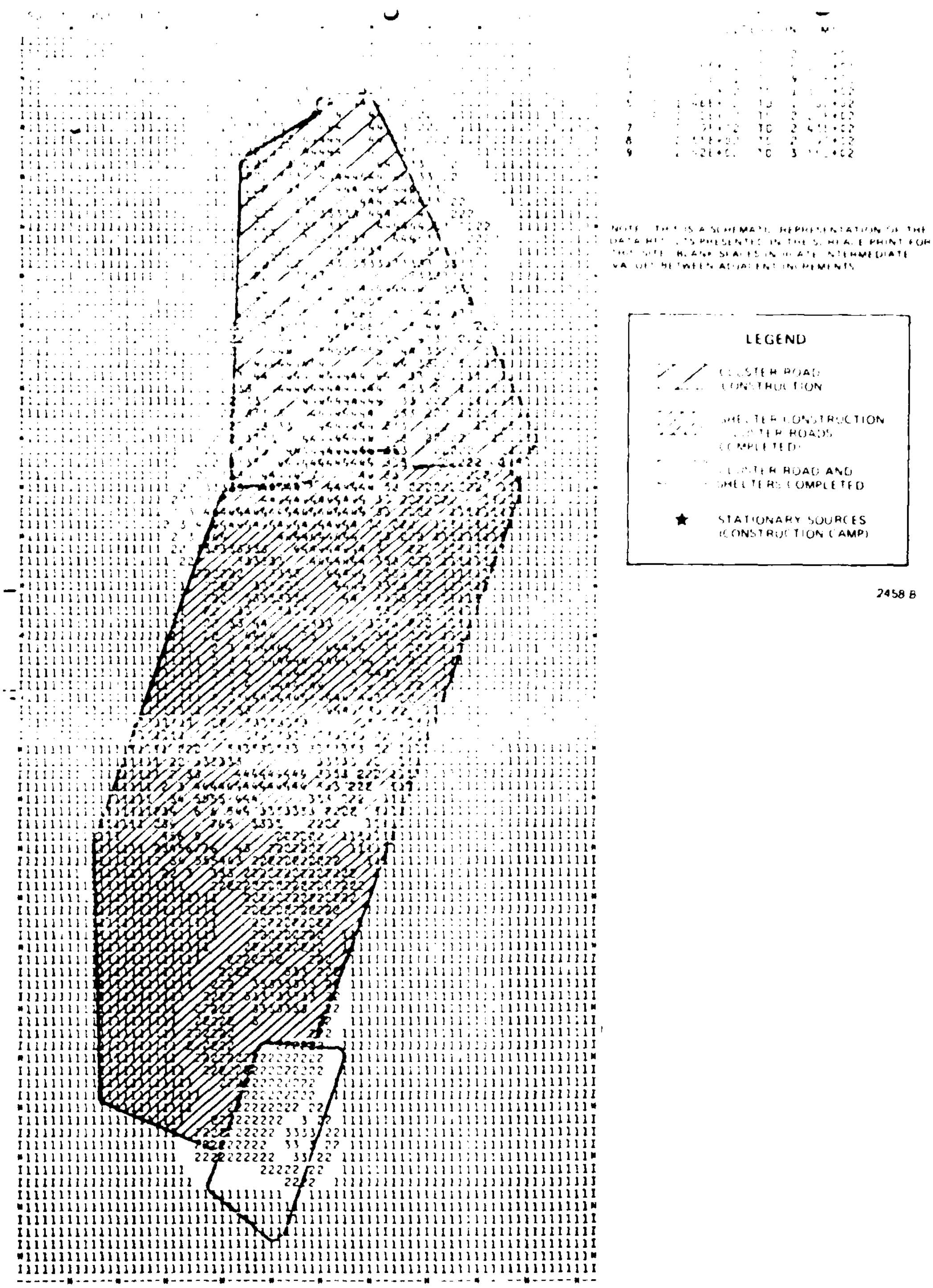


Figure 5.1.5-17. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dry Lake/Delamar Valleys: mitigated emissions for the loop system.

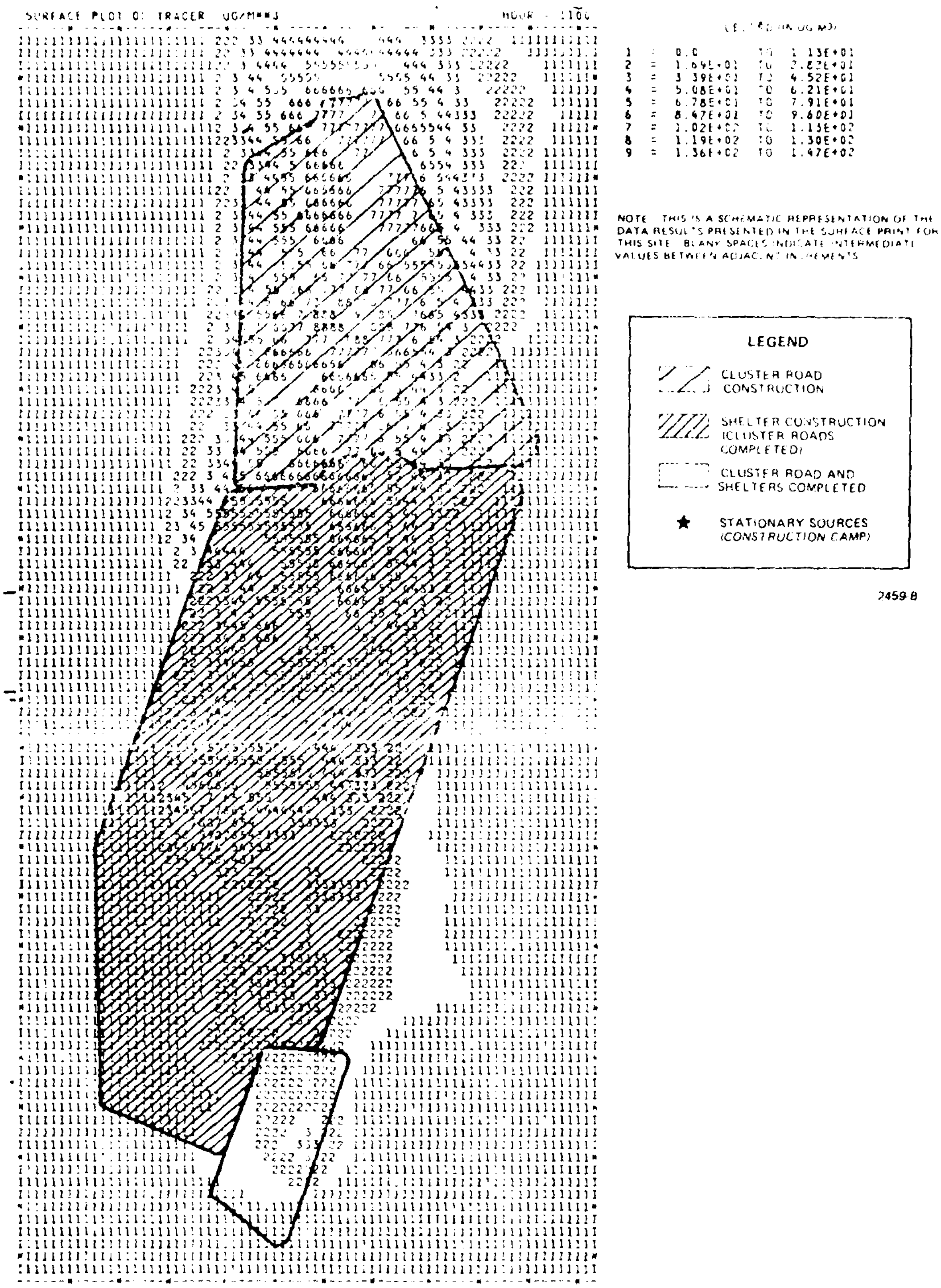


Figure 5.1.5-18. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dry Lake/Delamar Valleys: mitigated emissions for the loop system.

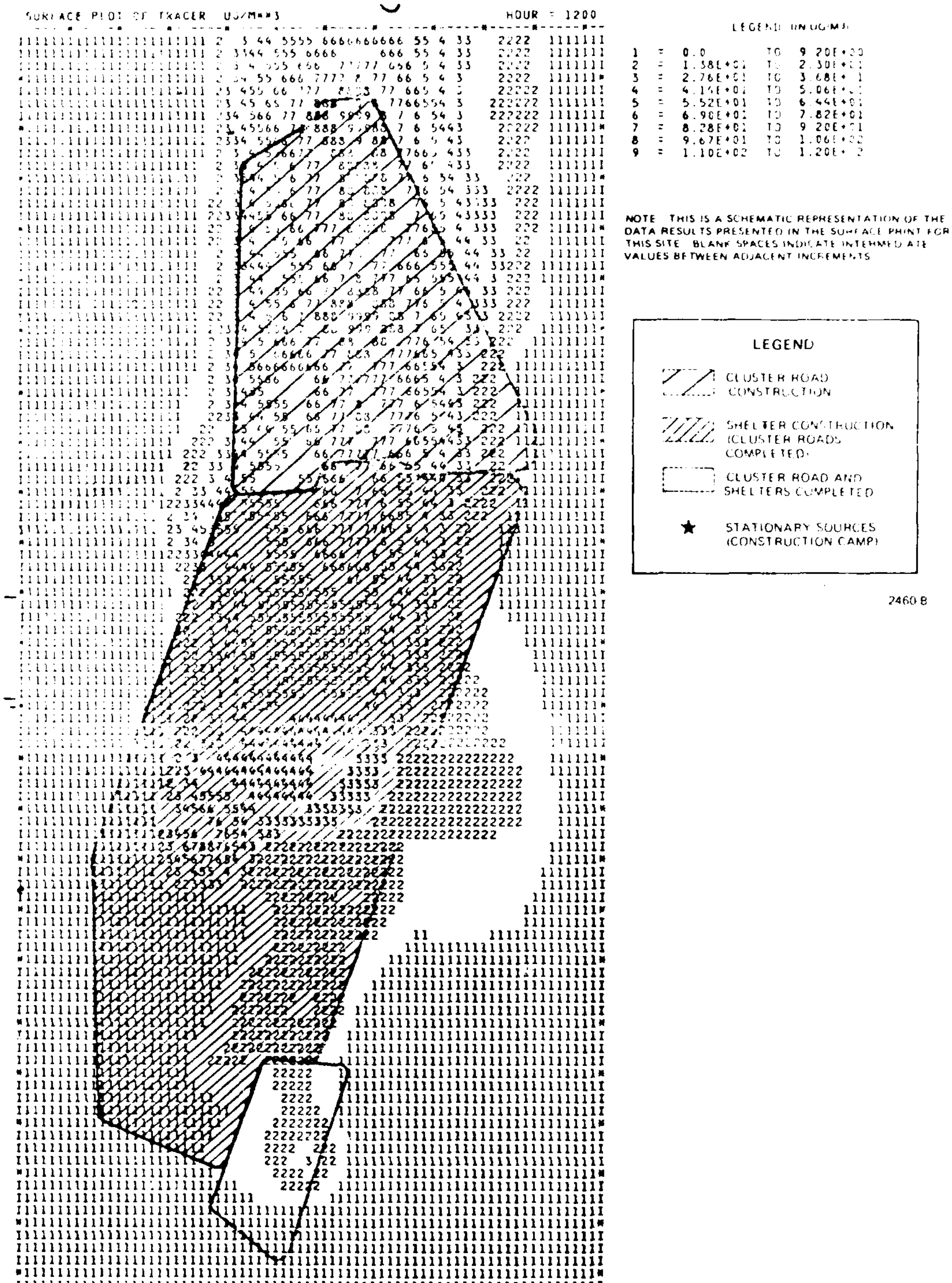


Figure 5.1.5-19. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dry Lake/Delamar Valleys: mitigated emissions for the loop systems.

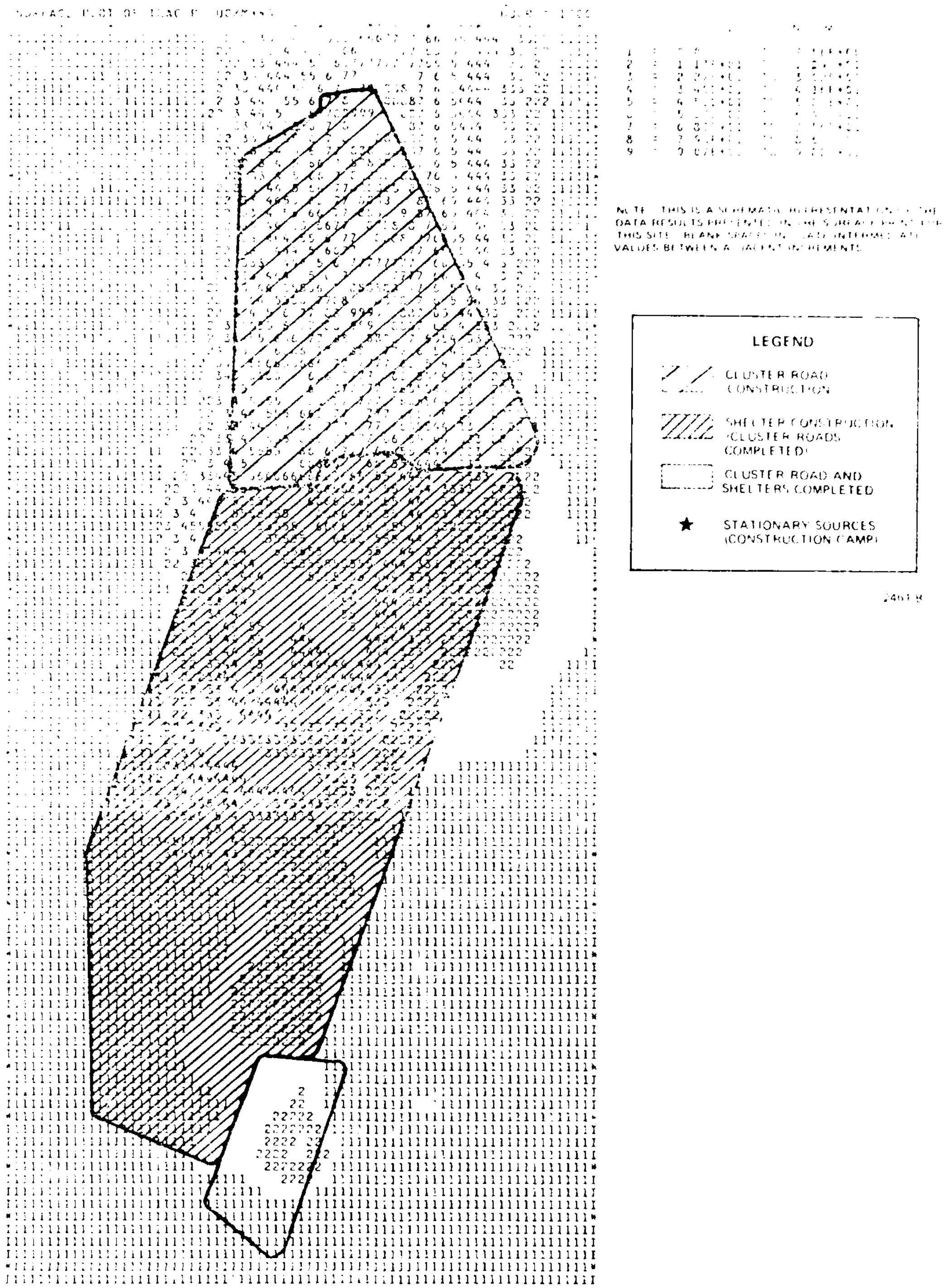


Figure 5.1.5-20. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dry Lake/Delamar Valleys: mitigated emissions for the loop system.

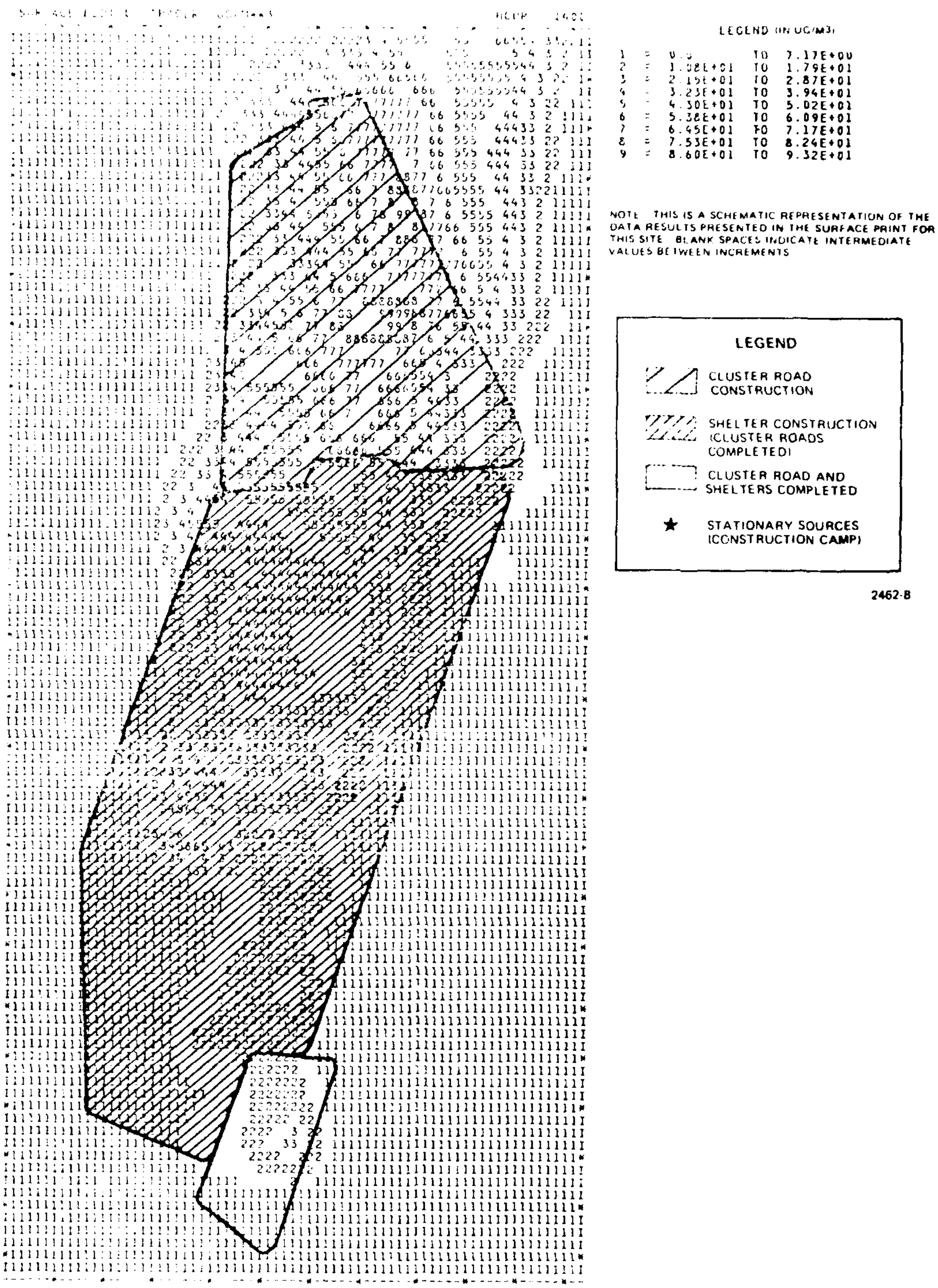


Figure 5.1.5-21. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dry Lake/Delamar Valleys: mitigated emissions for the loop system.

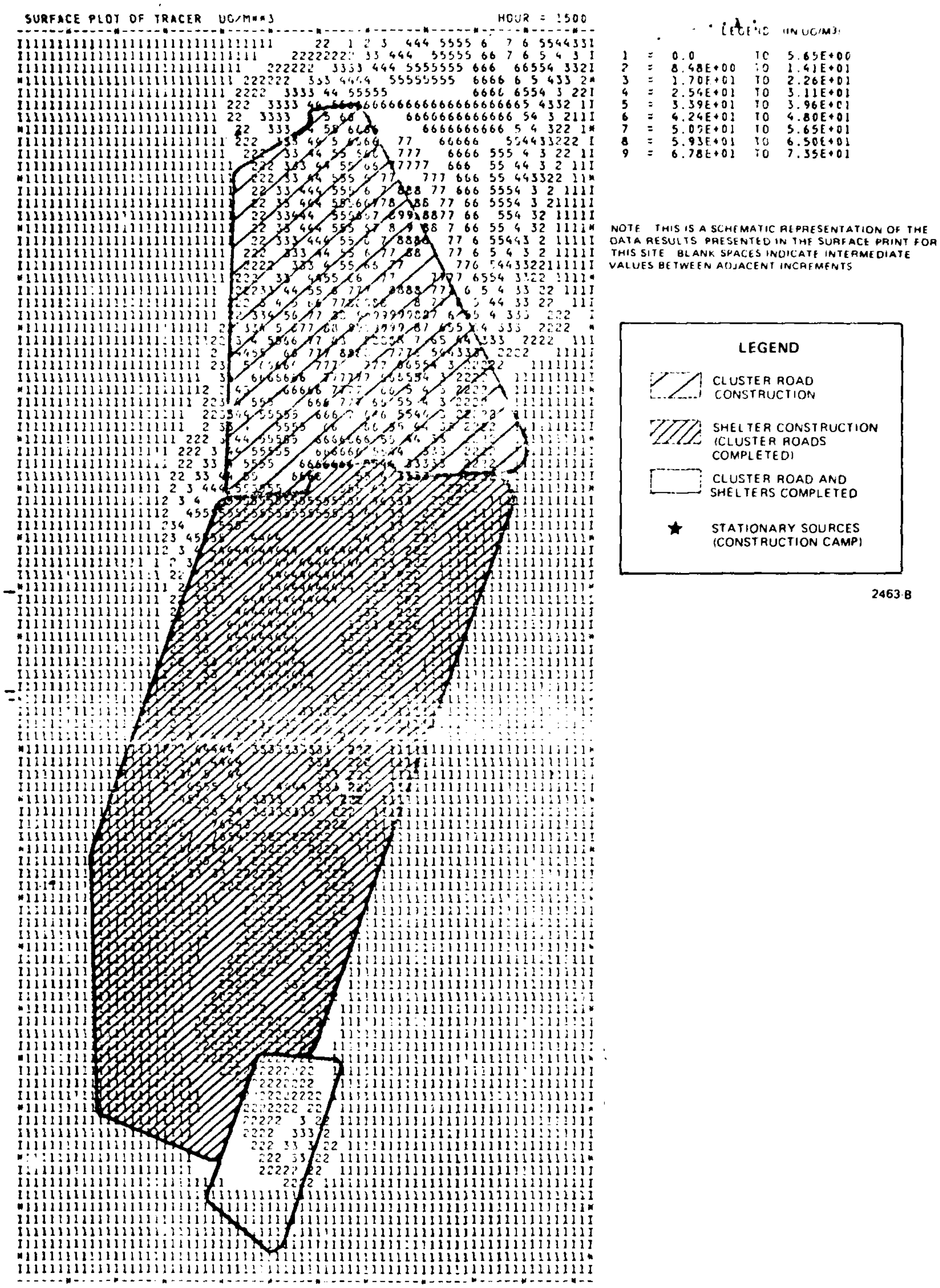


Figure 5.1.5-22. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dry Lake/Delamar Valleys: mitigated emissions for the loop system.

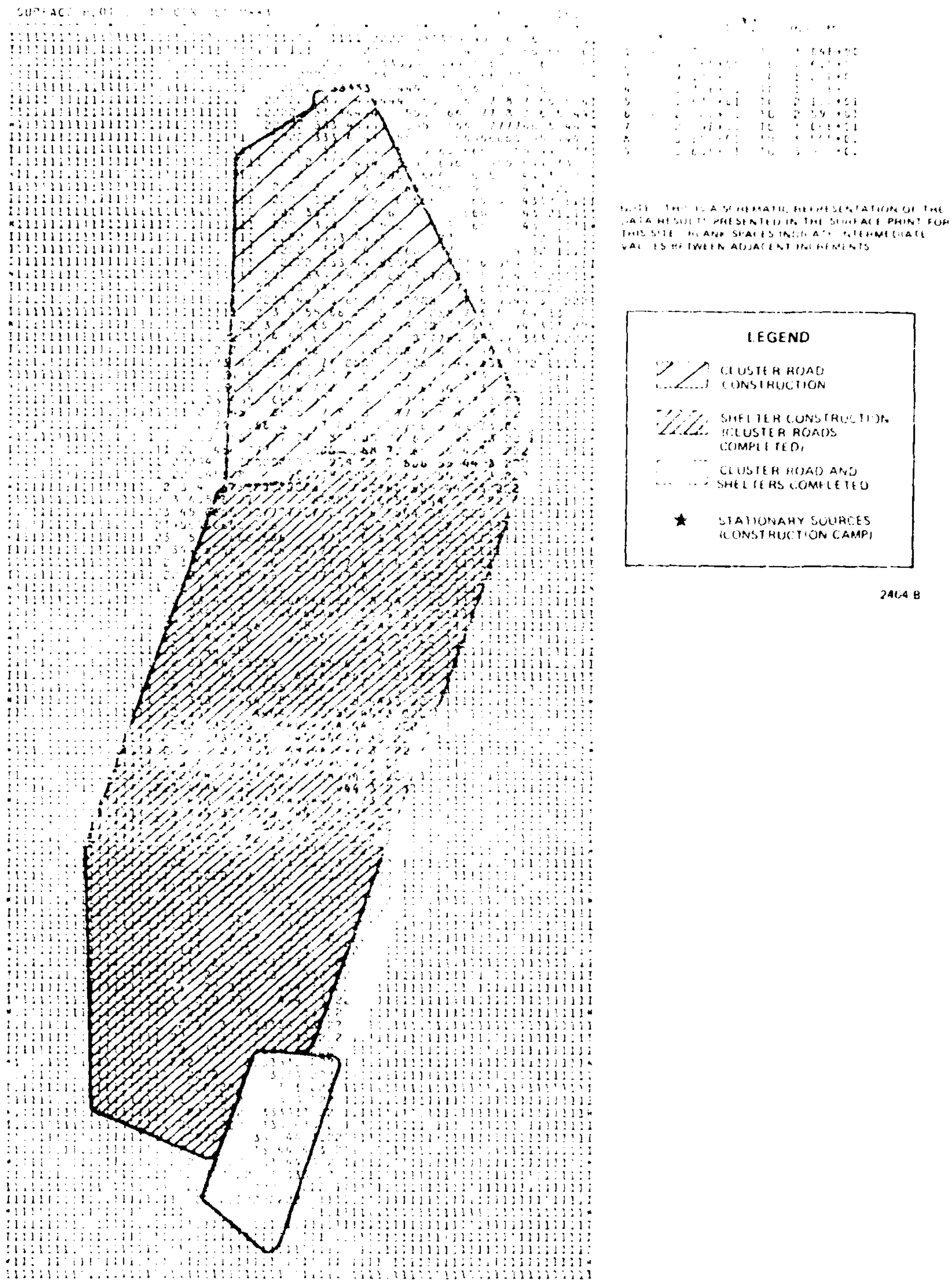


Figure 5.1.5-23. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dry Lake/Delamar Valleys: mitigated emissions for the loop system.

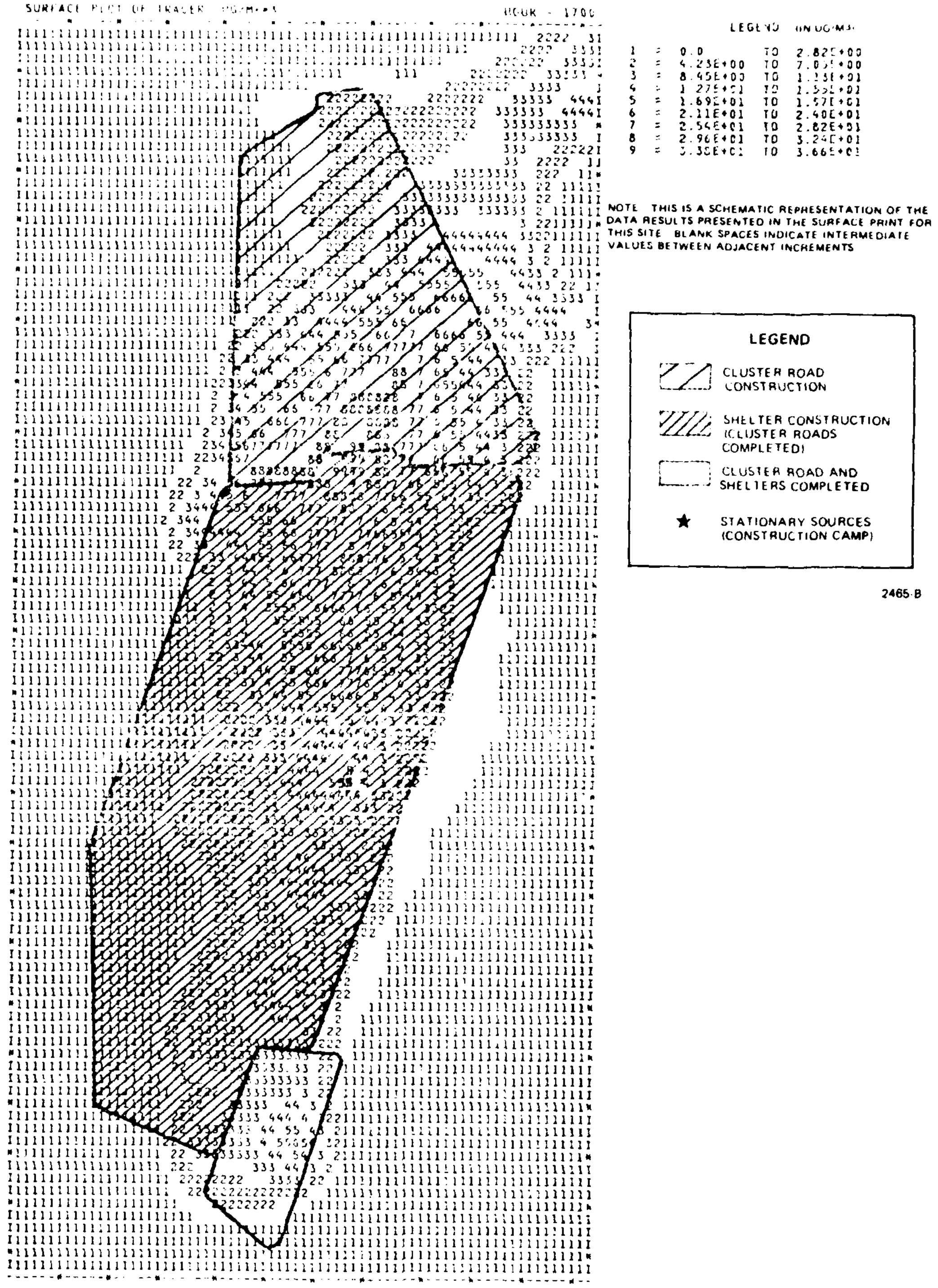


Figure 5.1.5-24. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads for the Dry Lake/Delamar Valleys: mitigated emissions for the loop system.

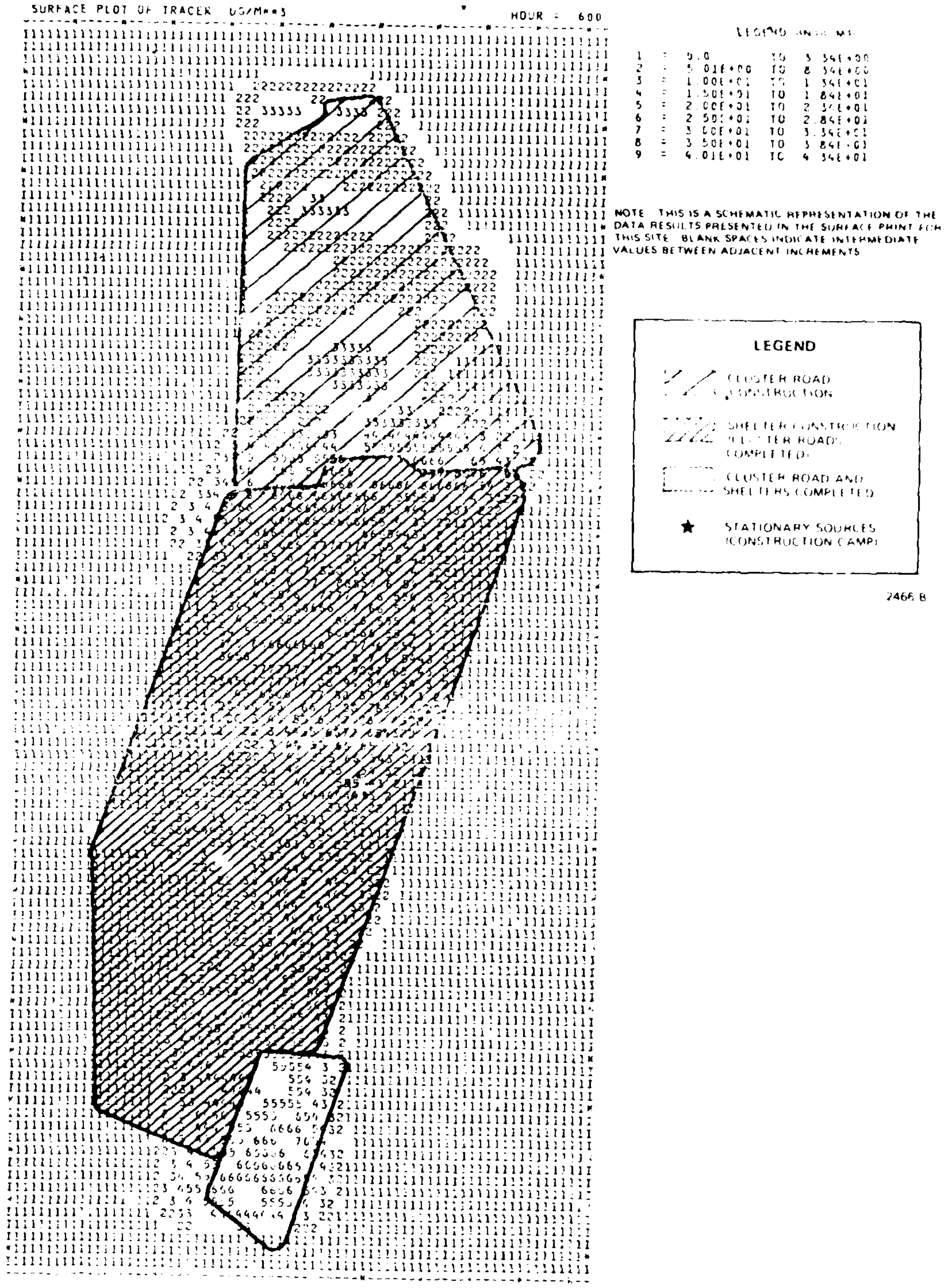


Figure 5.1.5-25. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dry Lake/Delamar Valleys: unmitigated emissions for the loop system.

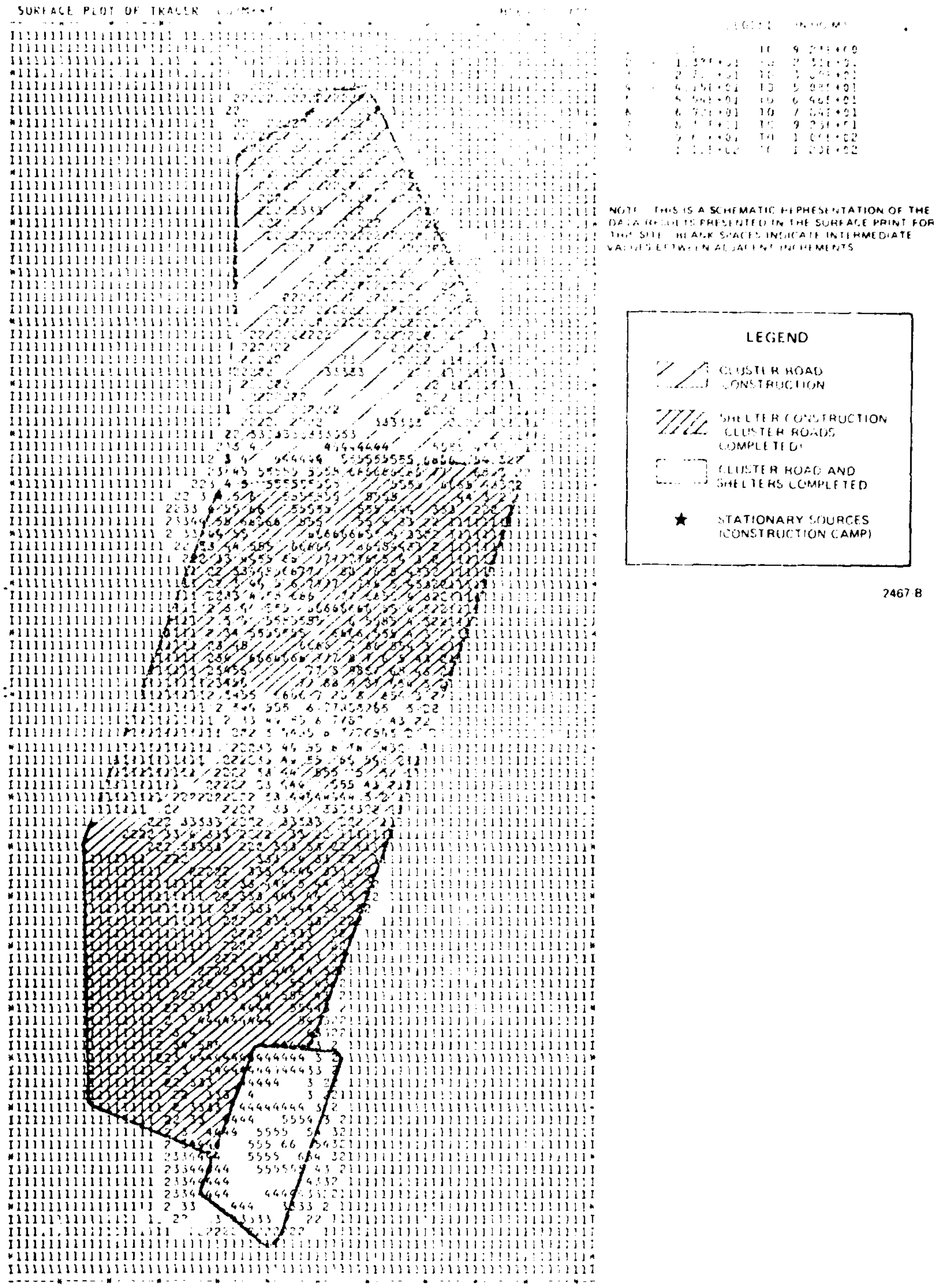


Figure 5.1.5-26. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dry Lake/Delamar Valleys: unmitigated emissions for the loop system.

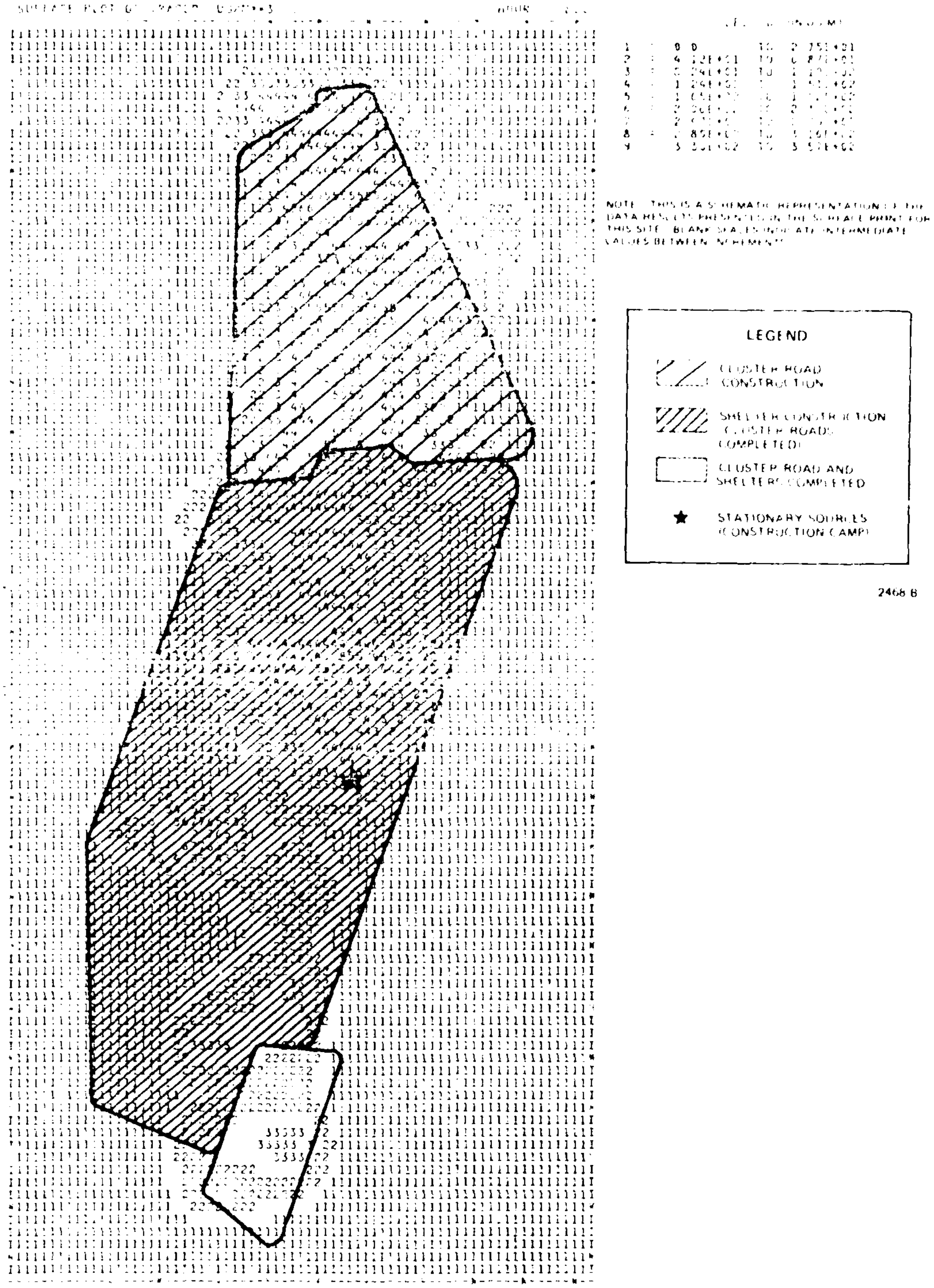


Figure 5.1.5-27. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dry Lake/Delamar Valleys: unmitigated emissions for the loop system.

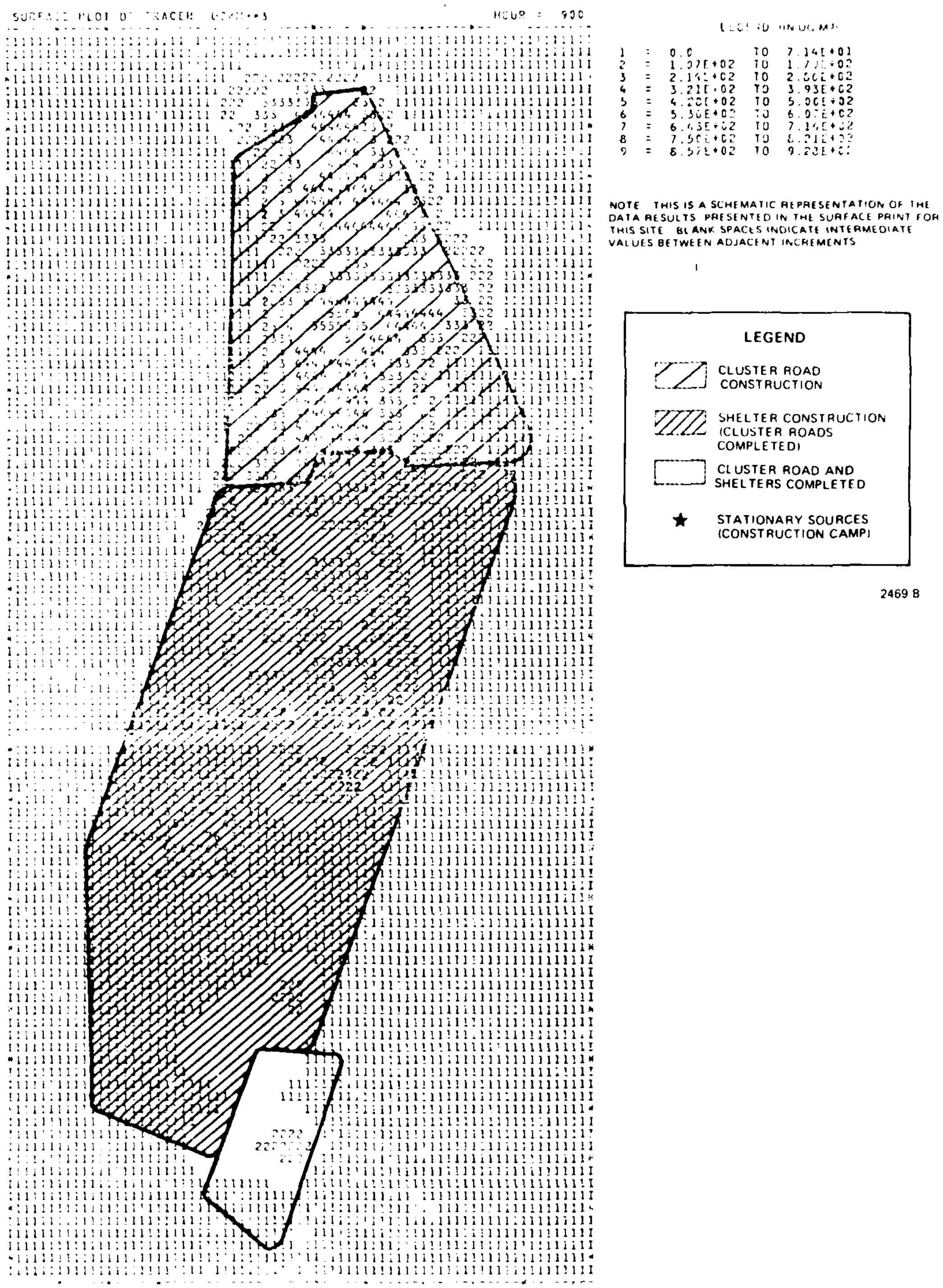


Figure 5.1.5-28. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dry Lake/Delamar Valleys: unmitigated emissions for the loop system.

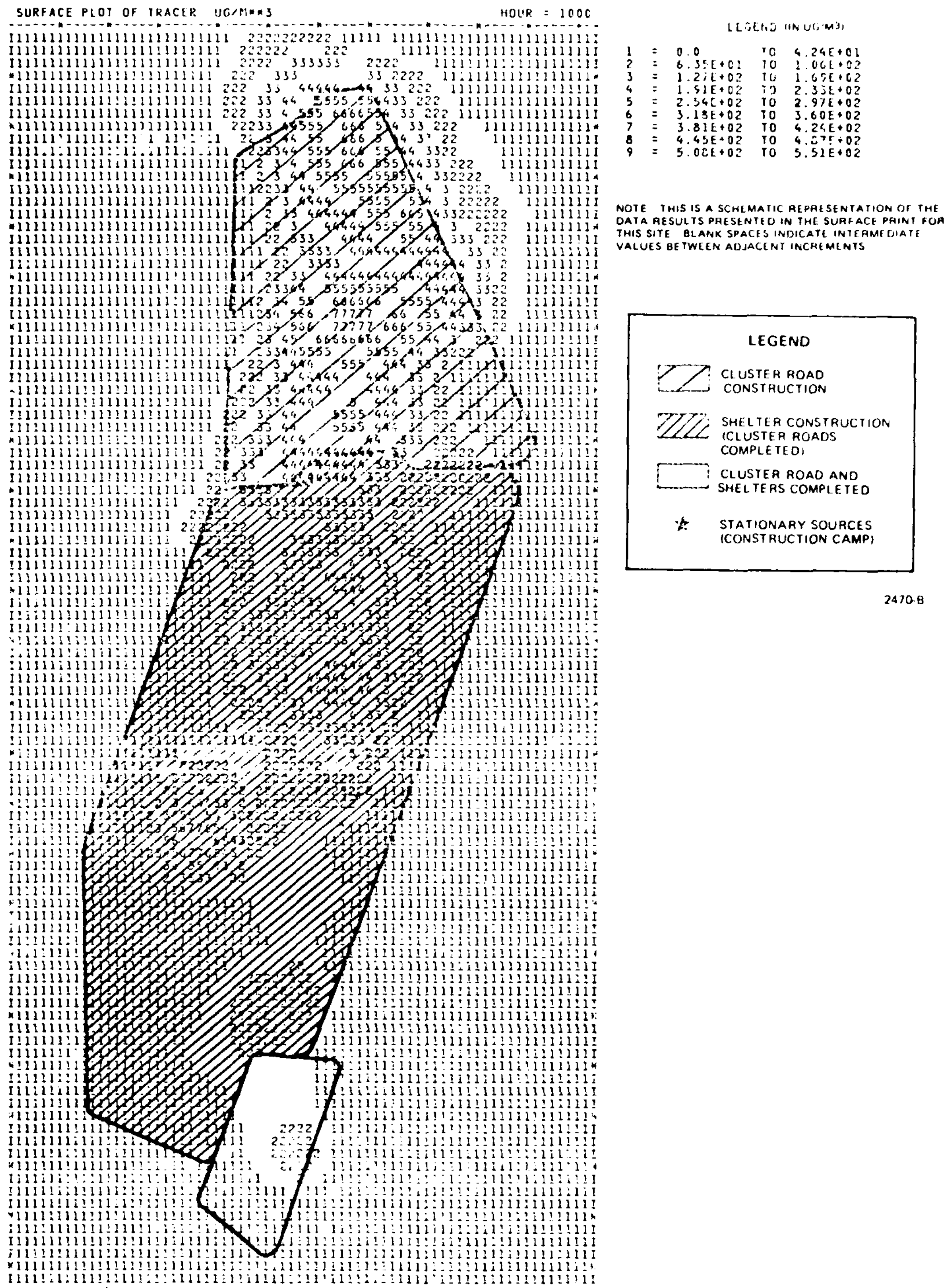


Figure 5.1.5-29. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dry Lake/Delamar Valleys: unmitigated emissions for the loop system.

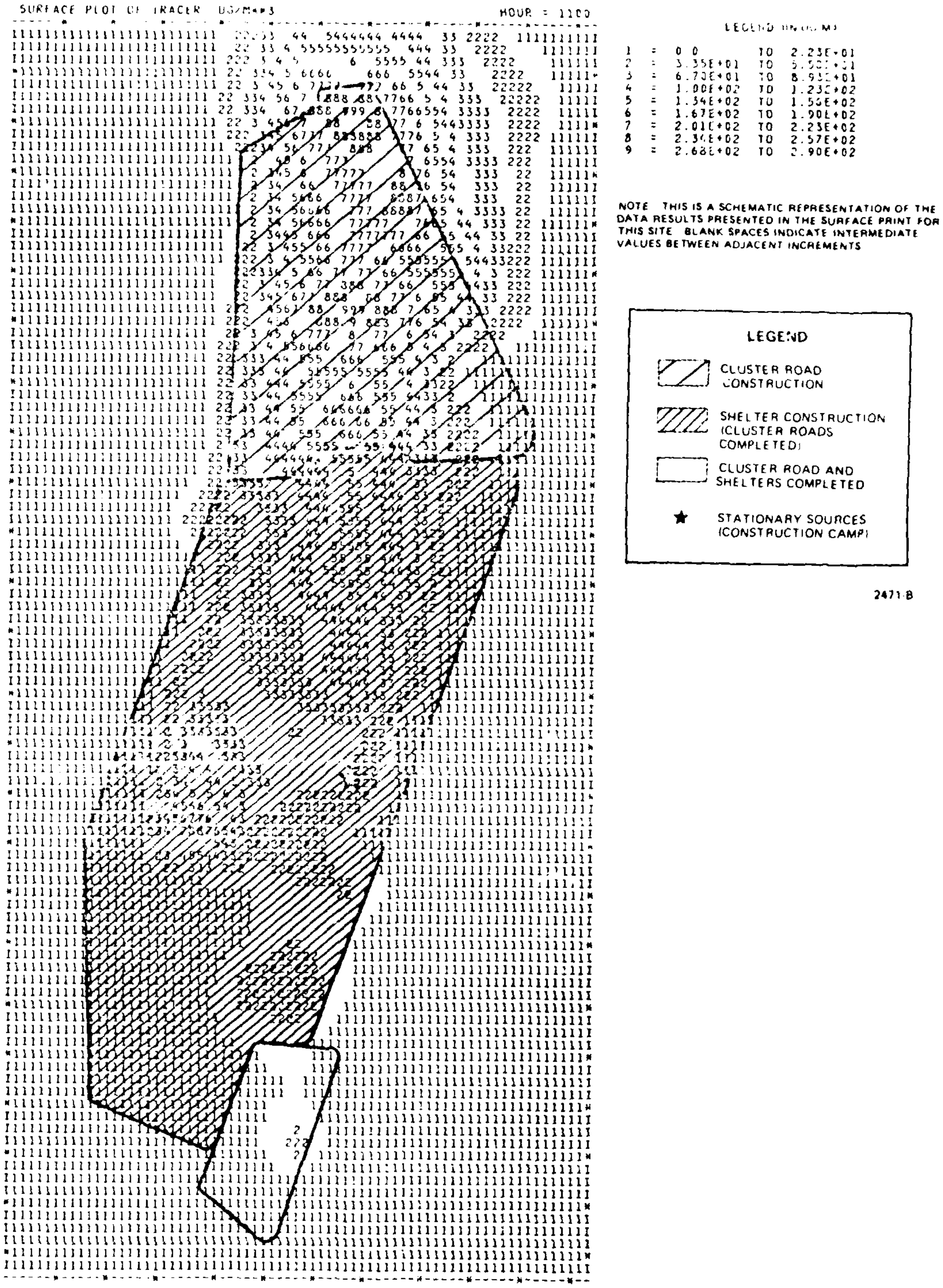


Figure 5.1.5-30. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dry Lake/Delamar Valleys: unmitigated emissions for the loop system.

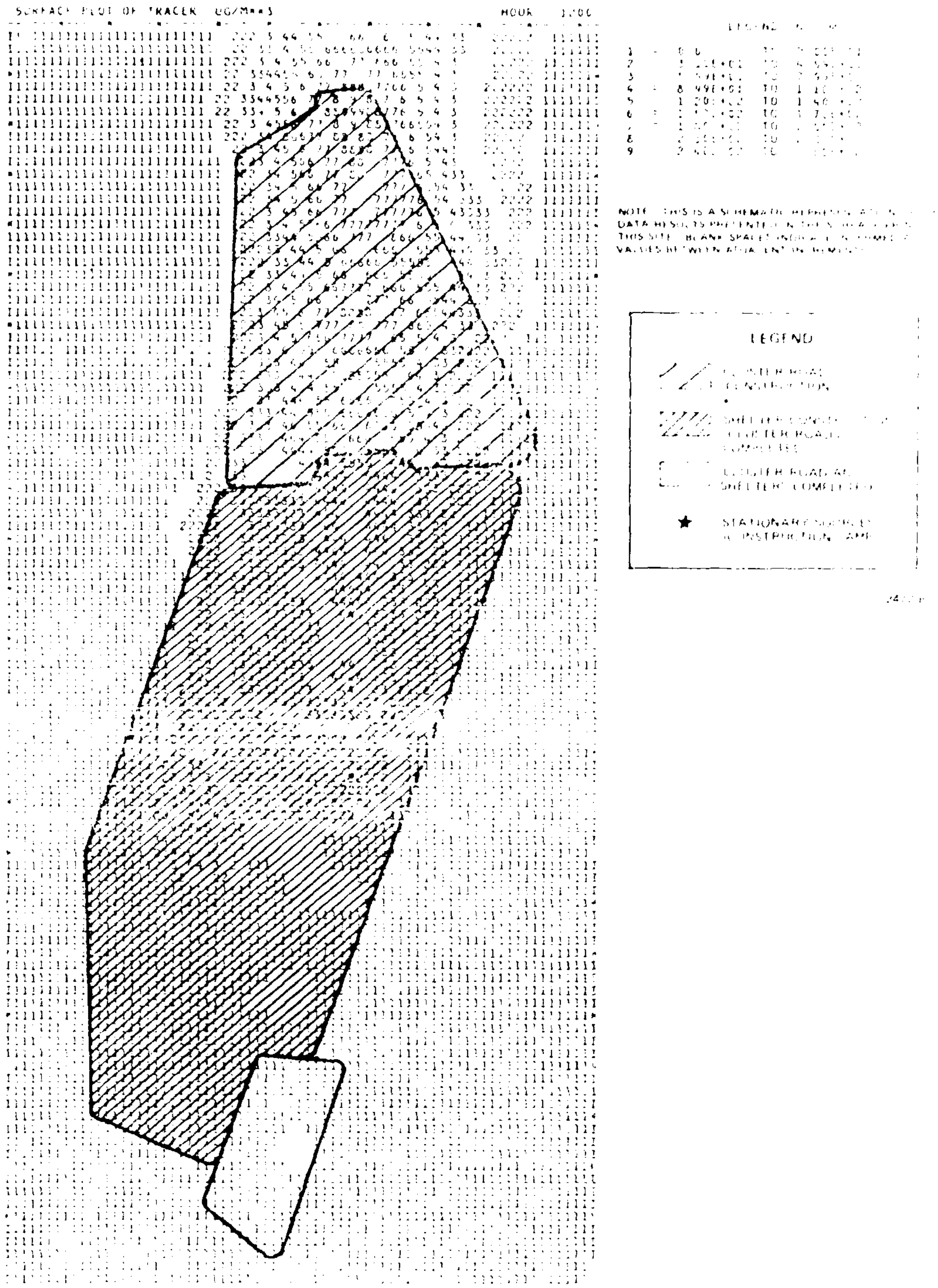


Figure 5.1.5-1. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dry Lake/Delamar Valleys: unmitigated emissions for the loop system.

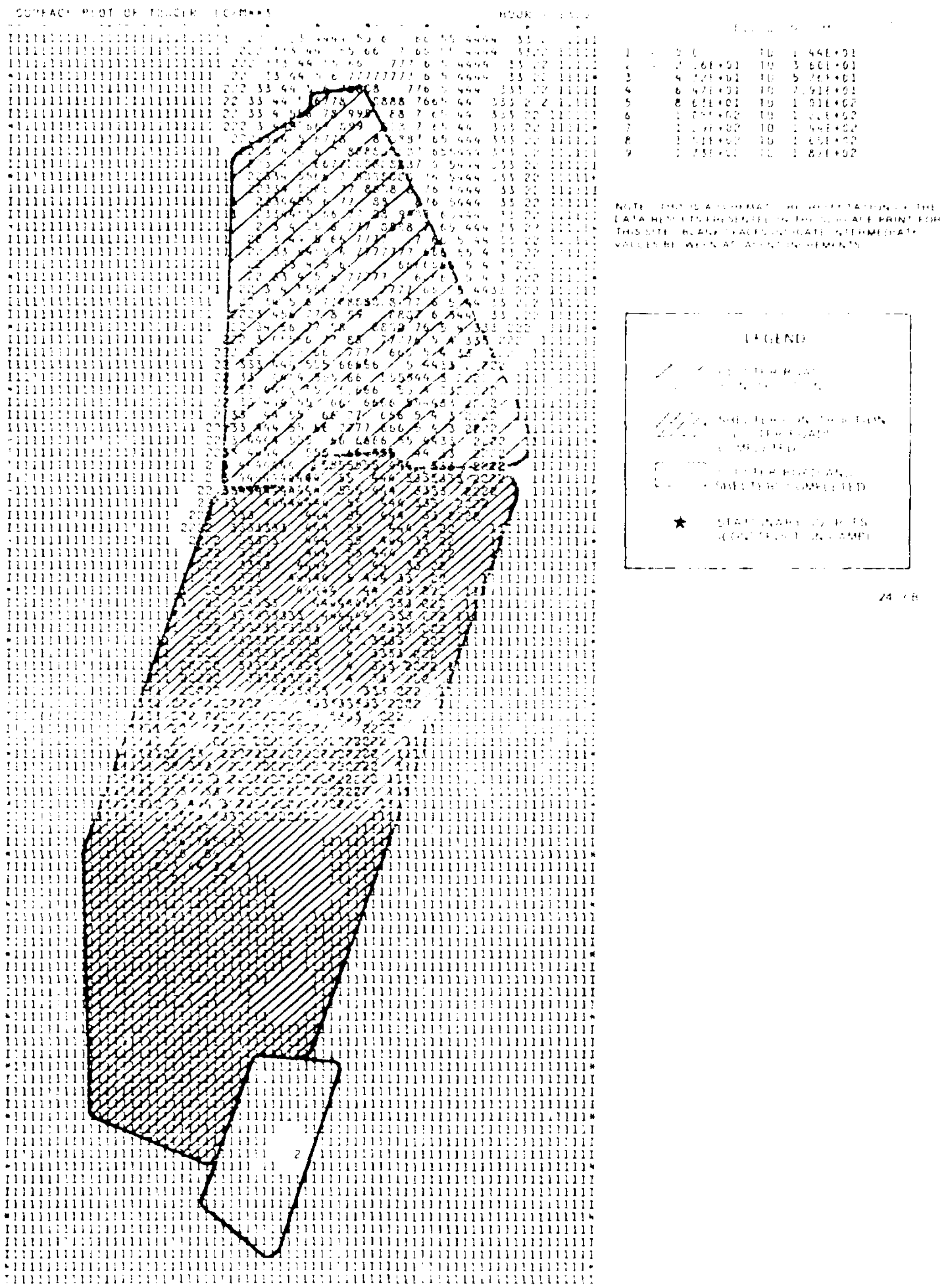


Figure 5.1.5-32. Predicted hourly particulate [illegible] the construction of shelters and clu[illegible] the Dry Lake/Delamar Valleys: unmitigated [illegible] the loop system.

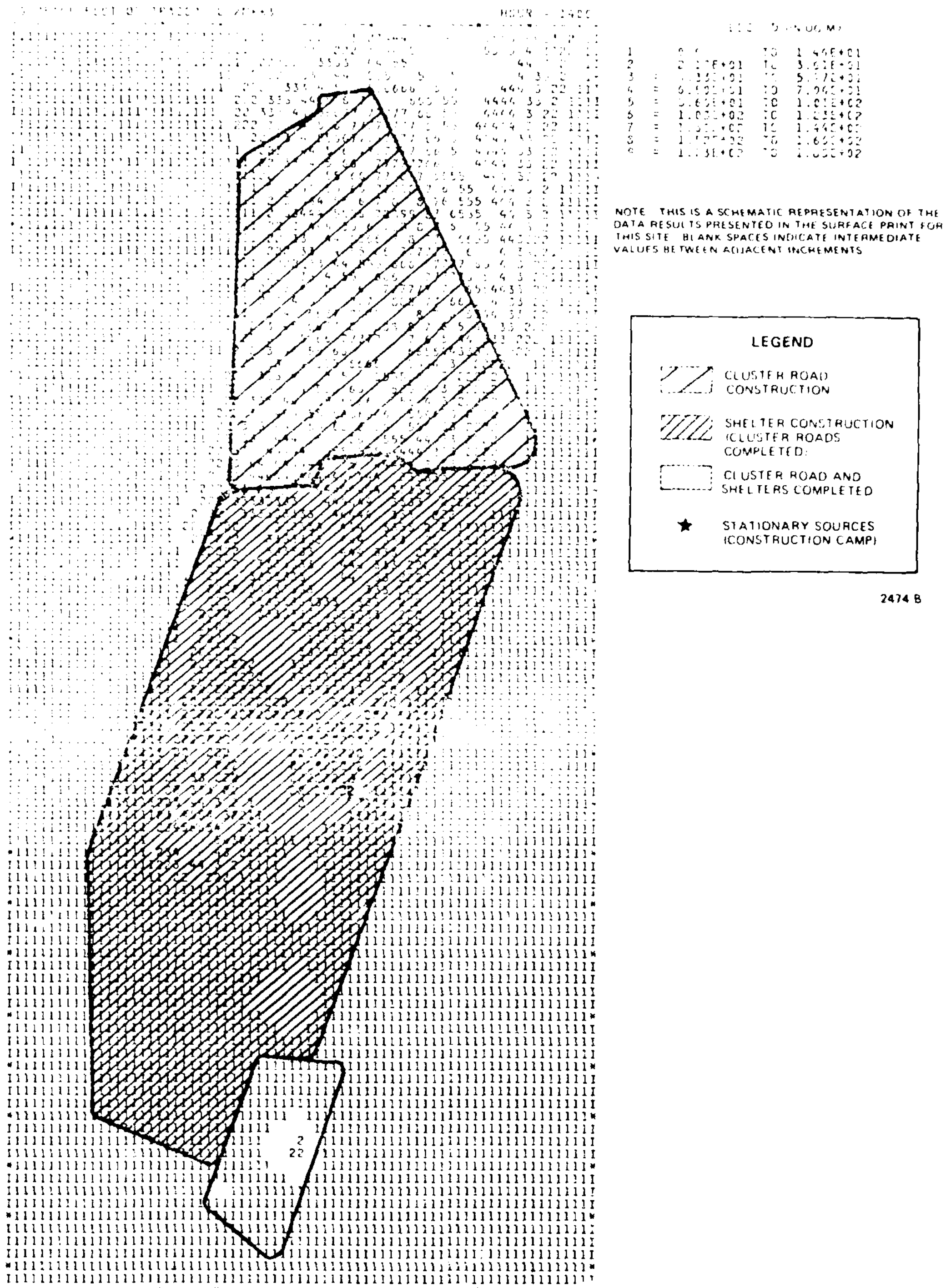


Figure 5.1.5-33. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dry Lake/Delamar Valleys: unmitigated emissions for the loop system.

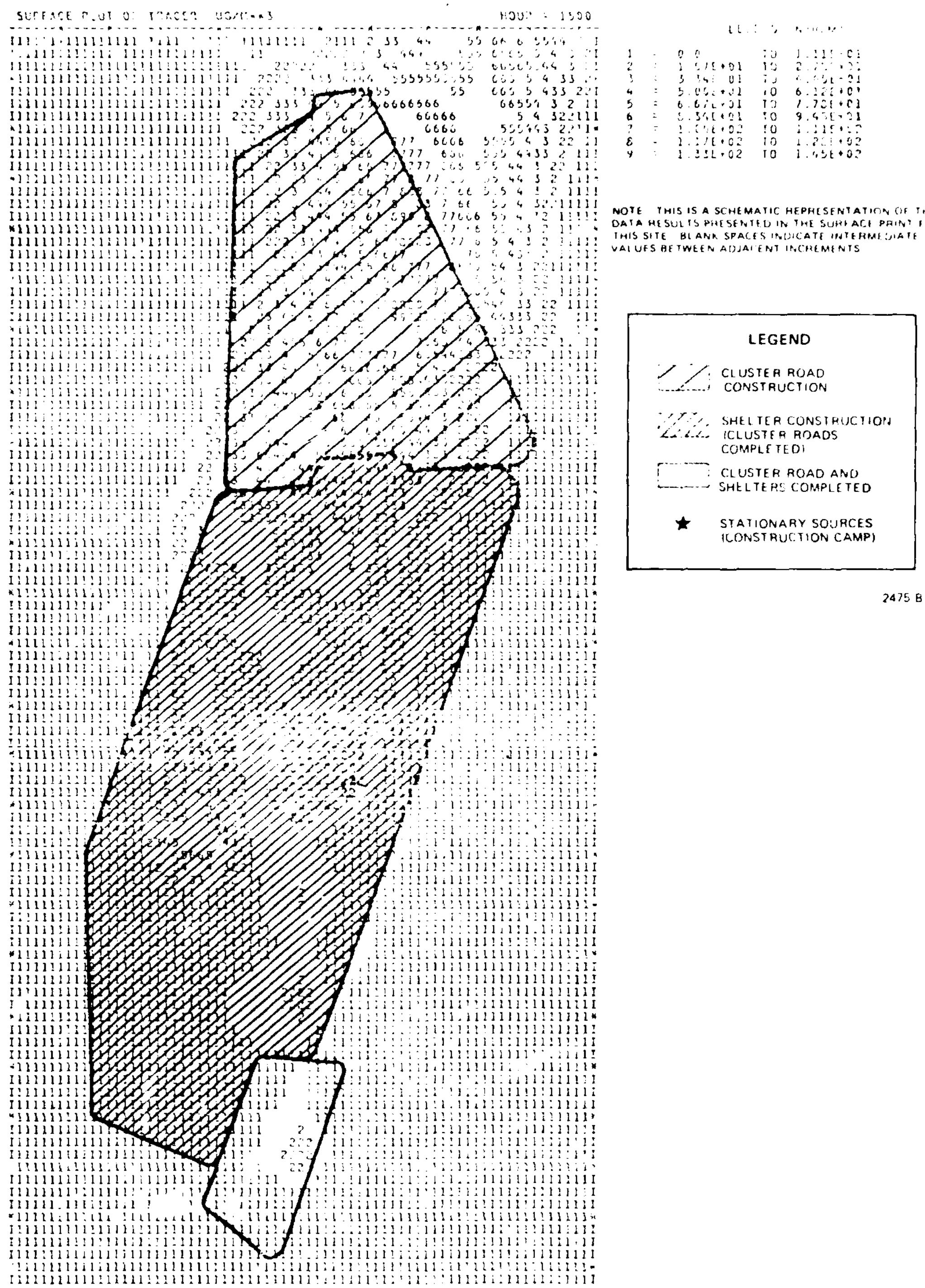


Figure 5.1.5-34. Predicted hourly particulate concentrations due to the construction of shel‘ ‘s and cluster roads in the Dry Lake/Delamar Valleys. unmitigated emissions for the loop system.

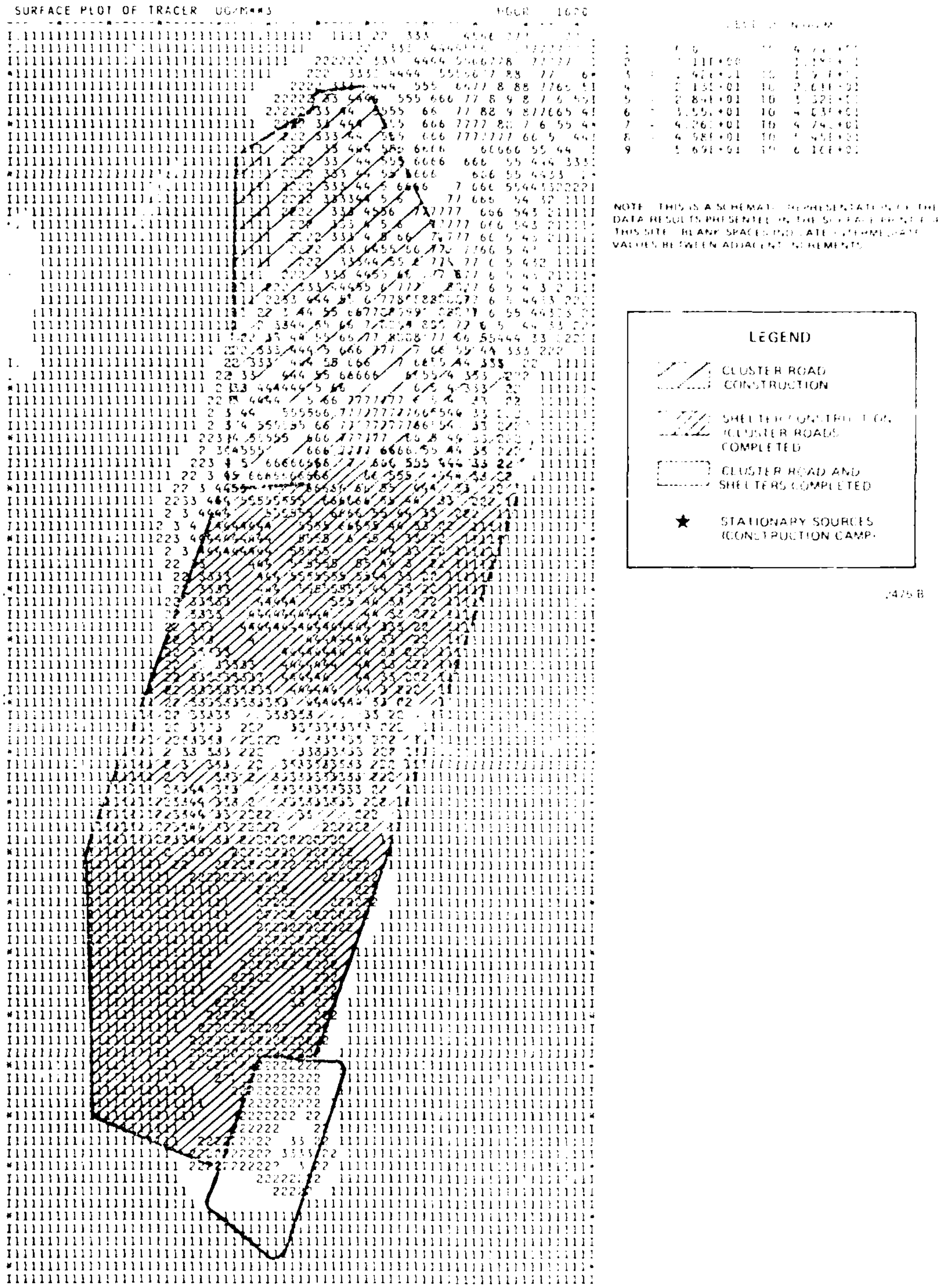


Figure 5.1.5-35. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dry Lake/Delamar Valleys: unmitigated emissions for the loop system.

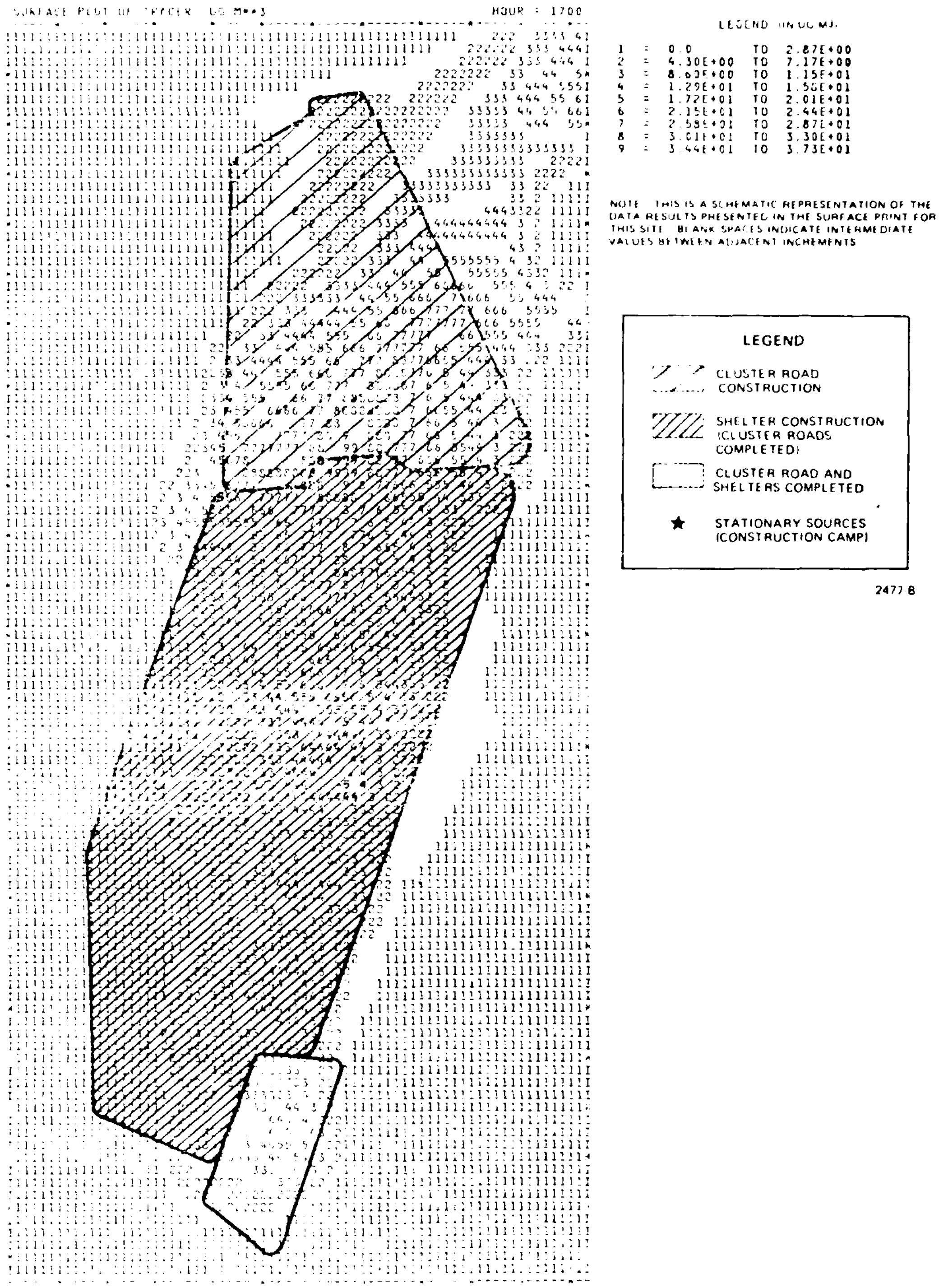


Figure 5.1.5-36. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dry Lake/Delamar Valleys: unmitigated emissions for the loop system.

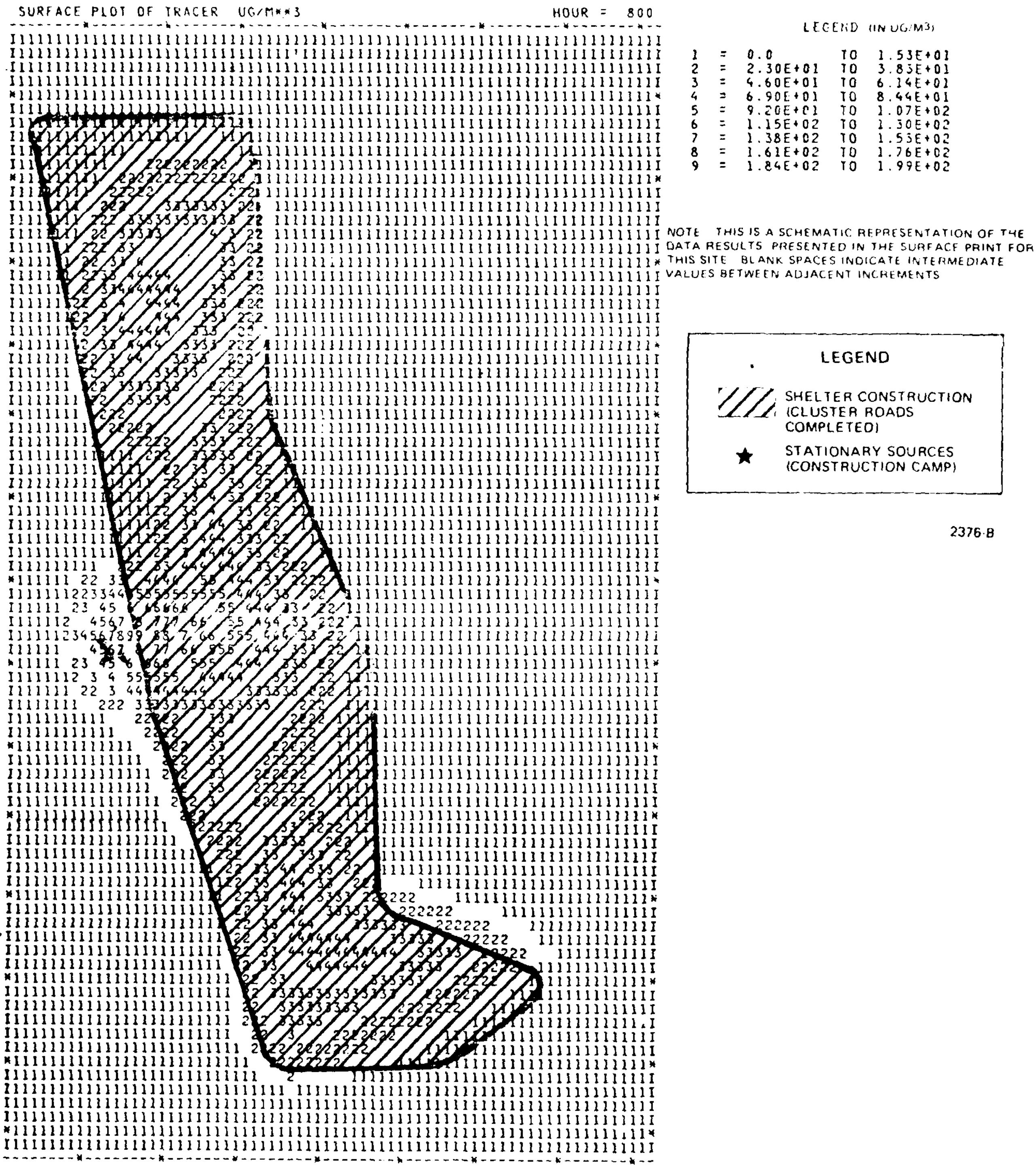
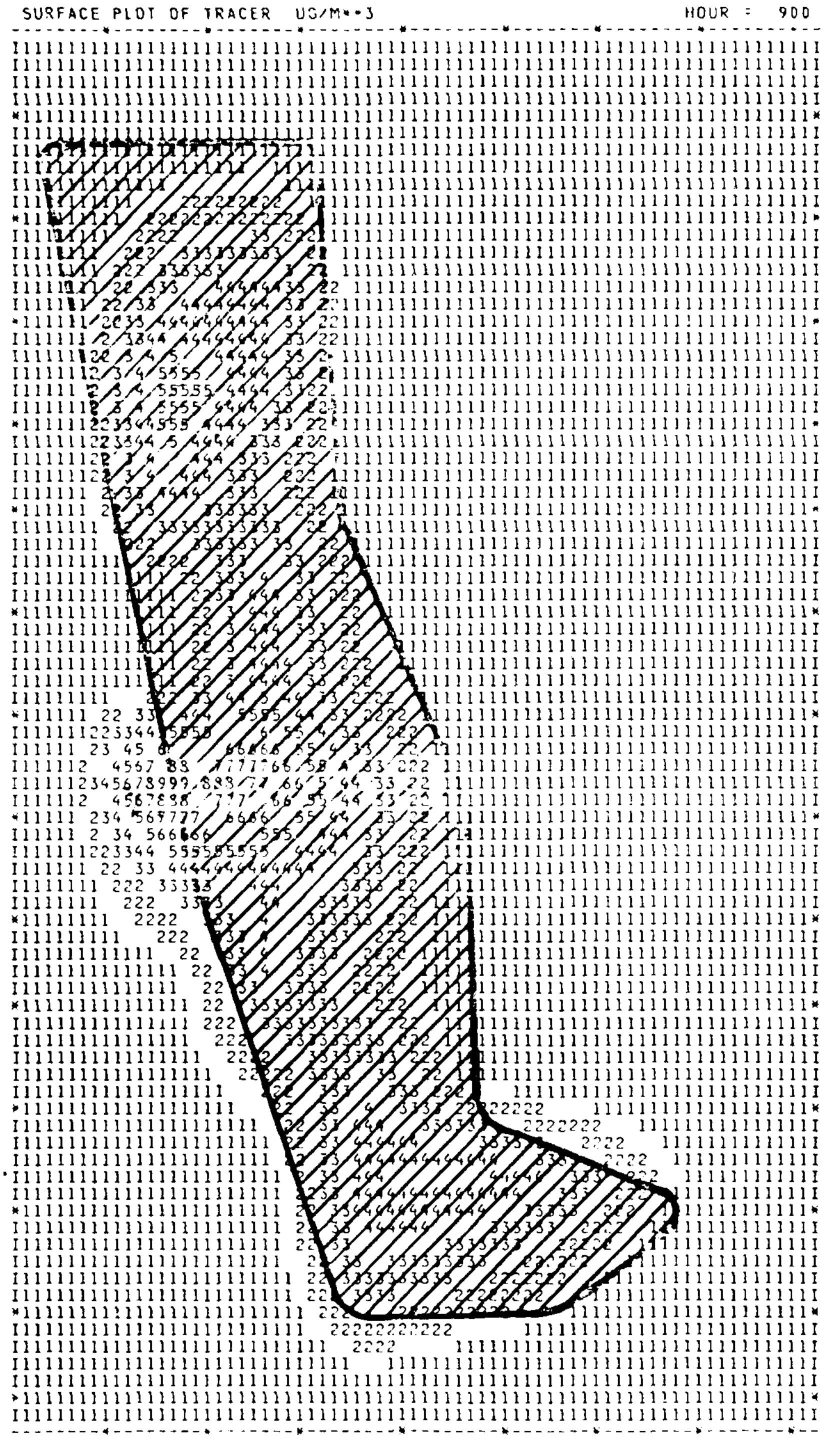


Figure 5.1.5-37. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Duckwater area.



LEGEND (IN UG/M3)

1	=	0.0	TO	2.75E+01
2	=	4.12E+01	TO	6.87E+01
3	=	8.24E+01	TO	1.10E+02
4	=	1.24E+02	TO	1.51E+02
5	=	1.65E+02	TO	1.92E+02
6	=	2.06E+02	TO	2.33E+02
7	=	2.47E+02	TO	2.75E+02
8	=	2.88E+02	TO	3.16E+02
9	=	3.30E+02	TO	3.57E+02

NOTE THIS IS A SCHEMATIC REPRESENTATION OF THE DATA RESULTS PRESENTED IN THE SURFACE PRINT FOR THIS SITE. BLANK SPACES INDICATE INTERMEDIATE VALUES BETWEEN ADJACENT INCREMENTS

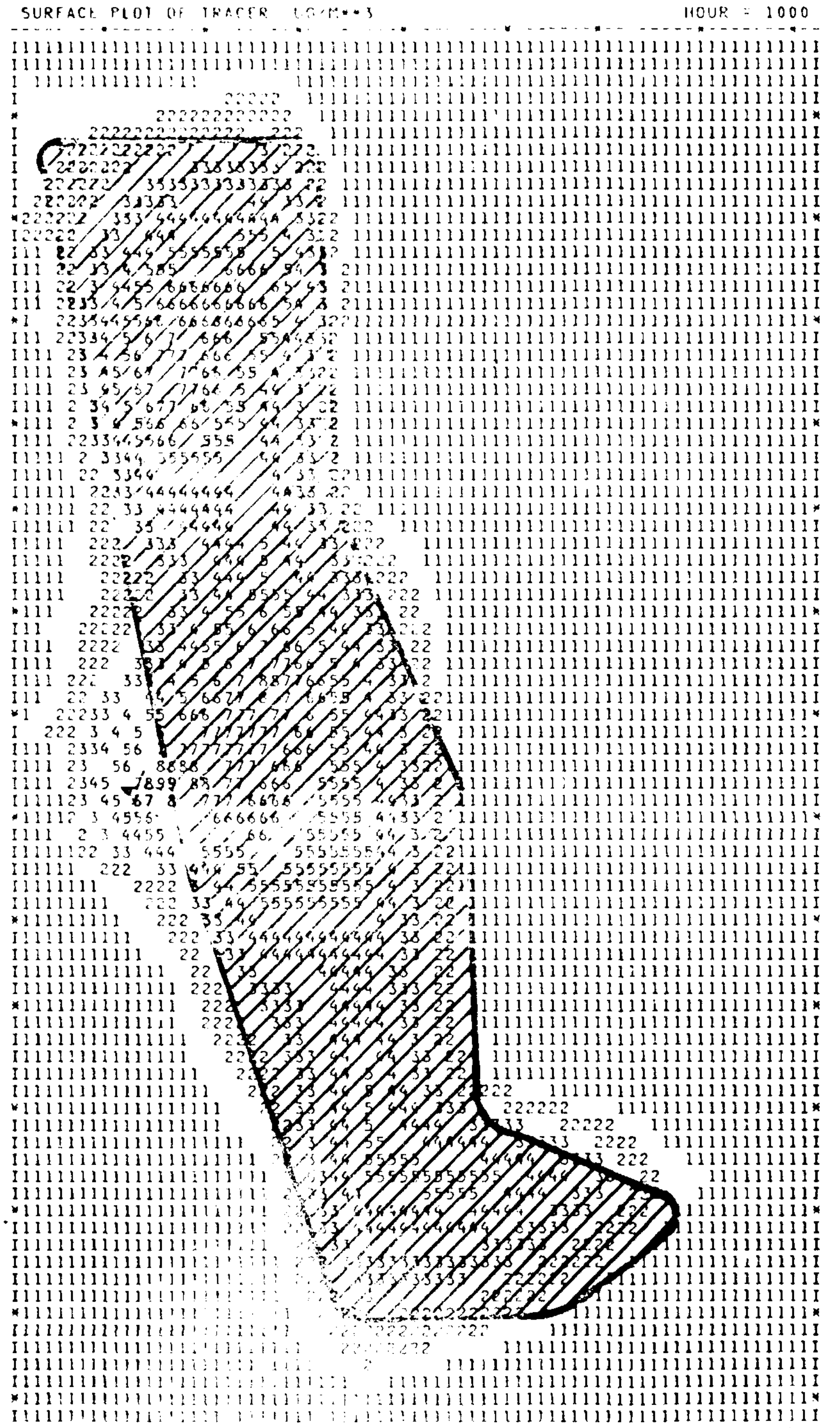
LEGEND

/// SHELTER CONSTRUCTION (CLUSTER ROADS COMPLETED)

★ STATIONARY SOURCES (CONSTRUCTION CAMP)

2377 B

Figure 5.1.5-38. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Duckwater area.



LEGEND (IN UG/M3)

1	=	0.0	TO	1.89E+01
2	=	2.84E+01	TO	4.73E+01
3	=	5.68E+01	TO	7.57E+01
4	=	8.52E+01	TO	1.04E+02
5	=	1.14E+02	TO	1.32E+02
6	=	1.42E+02	TO	1.61E+02
7	=	1.70E+02	TO	1.89E+02
8	=	1.99E+02	TO	2.18E+02
9	=	2.27E+02	TO	2.46E+02

NOTE THIS IS A SCHEMATIC REPRESENTATION OF THE DATA RESULTS PRESENTED IN THE SURFACE PRINT FOR THIS SITE. BLANK SPACES INDICATE INTERMEDIATE VALUES BETWEEN ADJACENT INCREMENTS

LEGEND

/// SHELTER CONSTRUCTION (CLUSTER ROADS COMPLETED)

★ STATIONARY SOURCES (CONSTRUCTION CAMP)

2378-B

Figure 5.3.5-39. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Buckwater area.

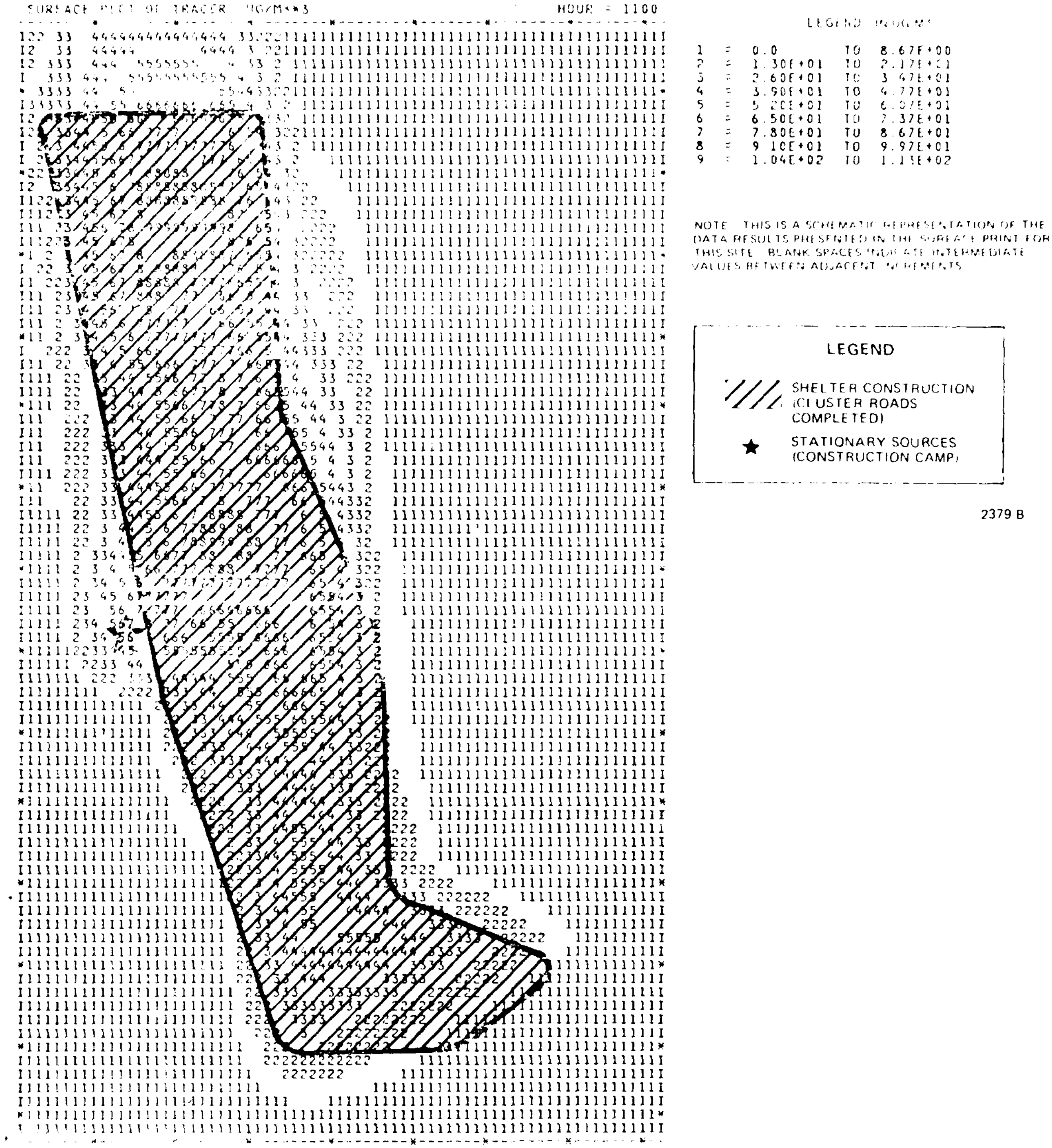


Figure 5.1.5-46. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Duckwater area.

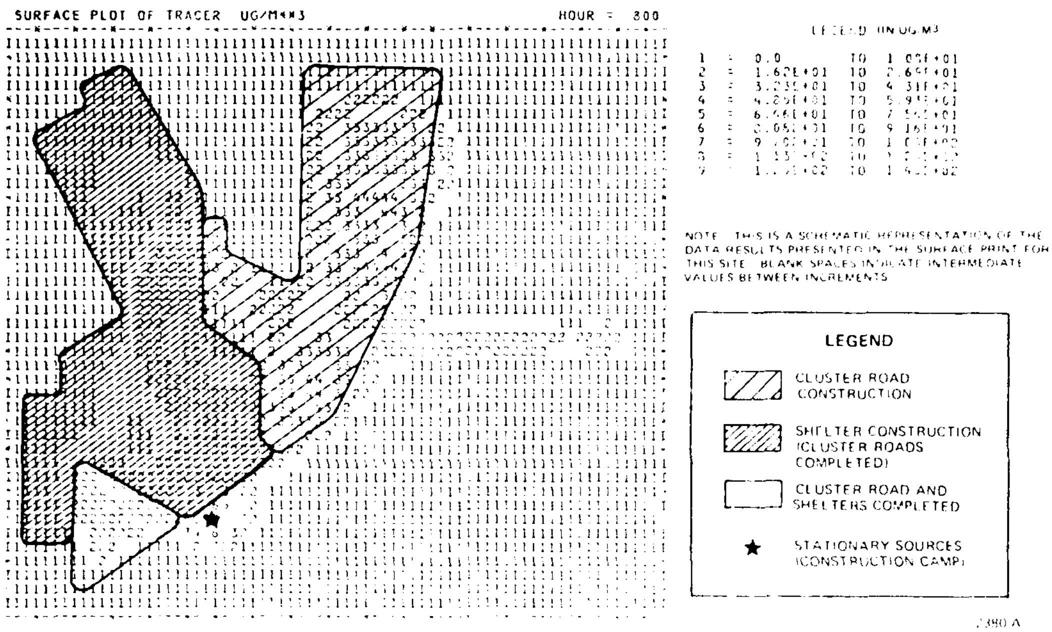


Figure 5.1.5-41. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Delta area.

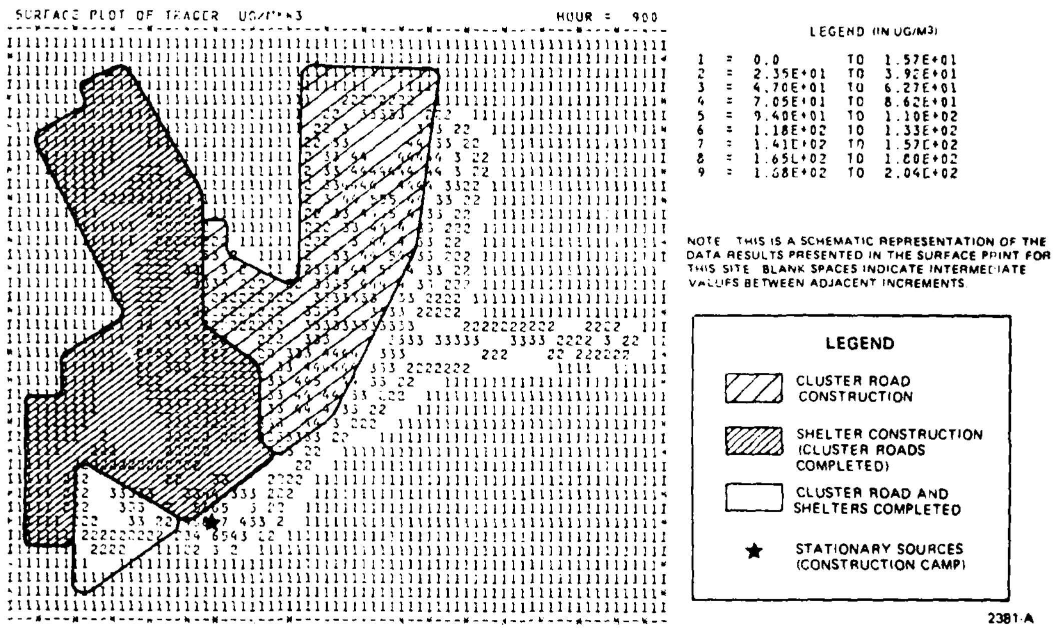


Figure 5.1.5-42. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Delta area.

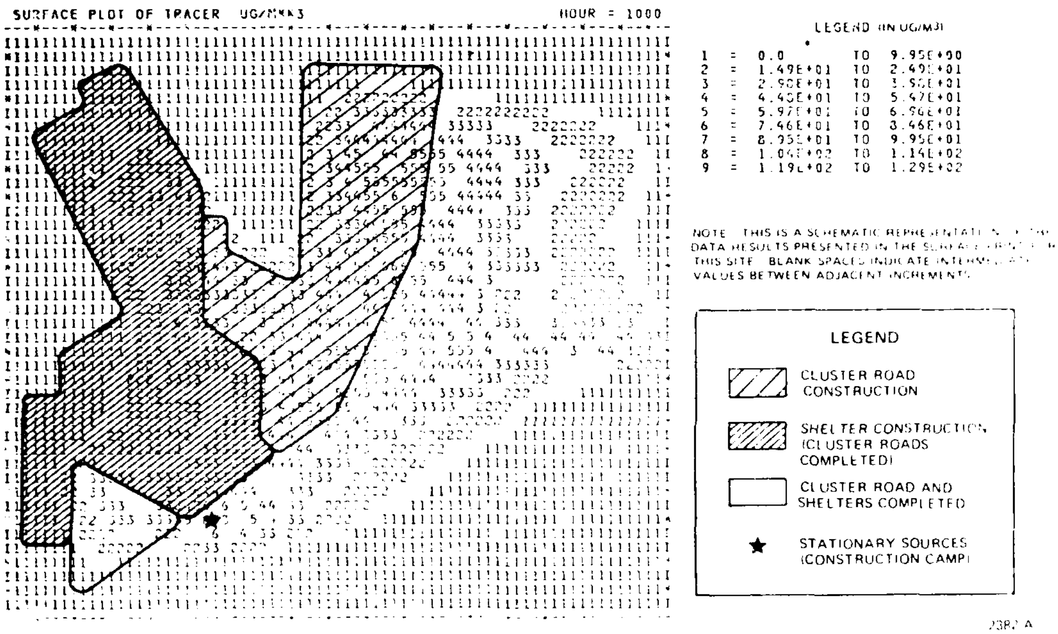


Figure 5.1.5-43. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Delta area.

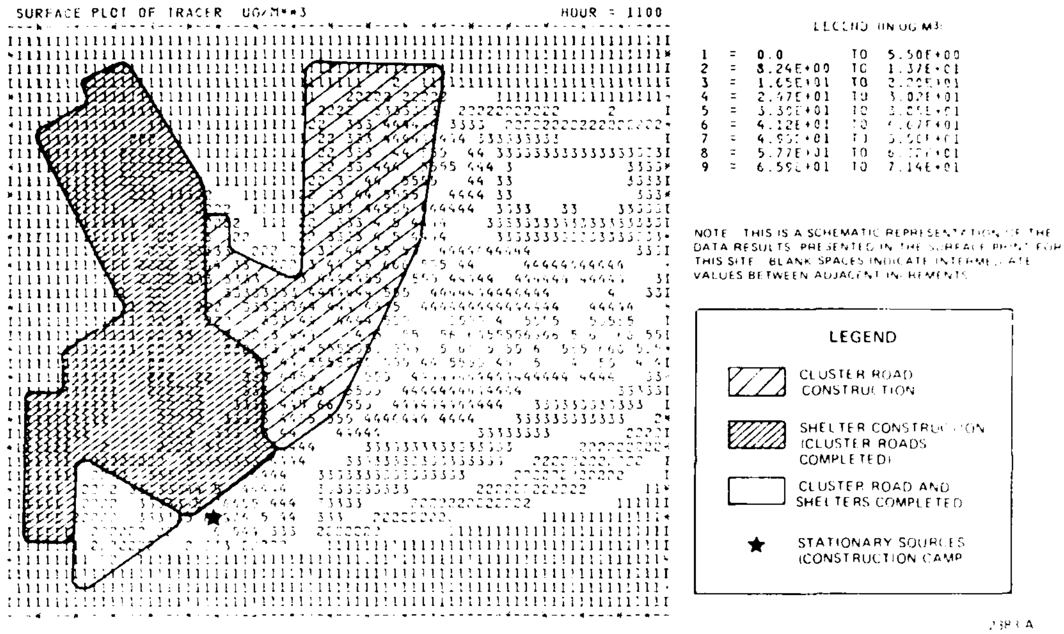


Figure 5.1.5-44. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Delta area.

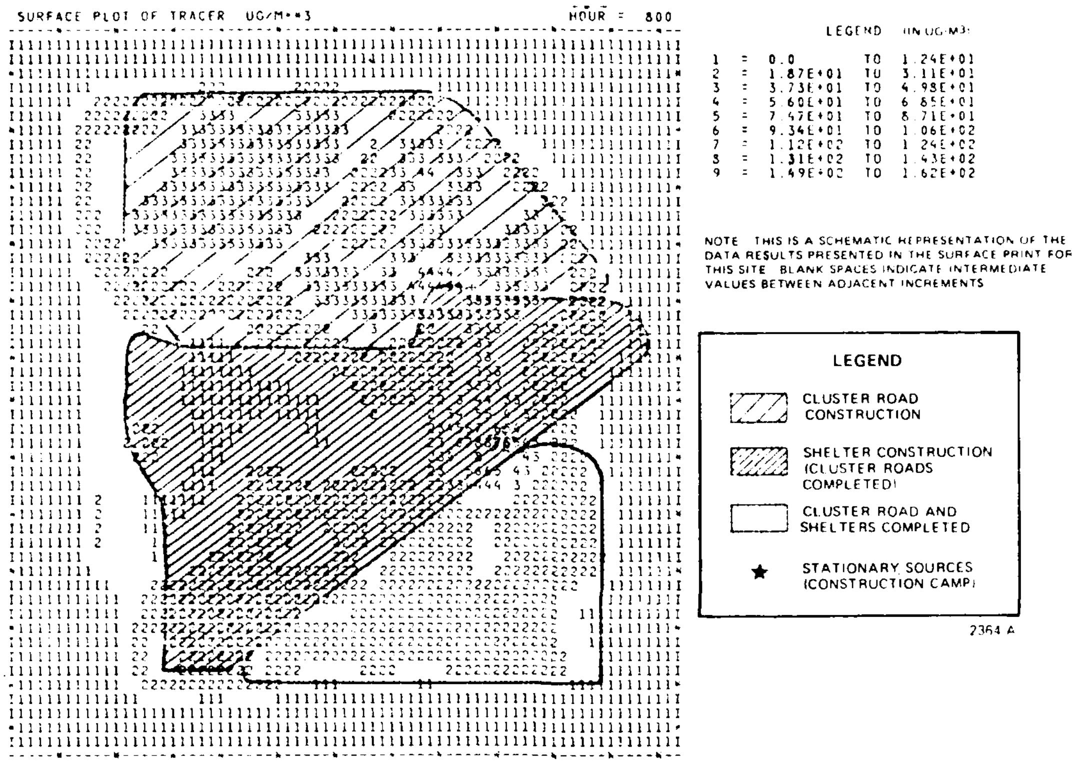


Figure 5.1.5-45. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dalhart area.

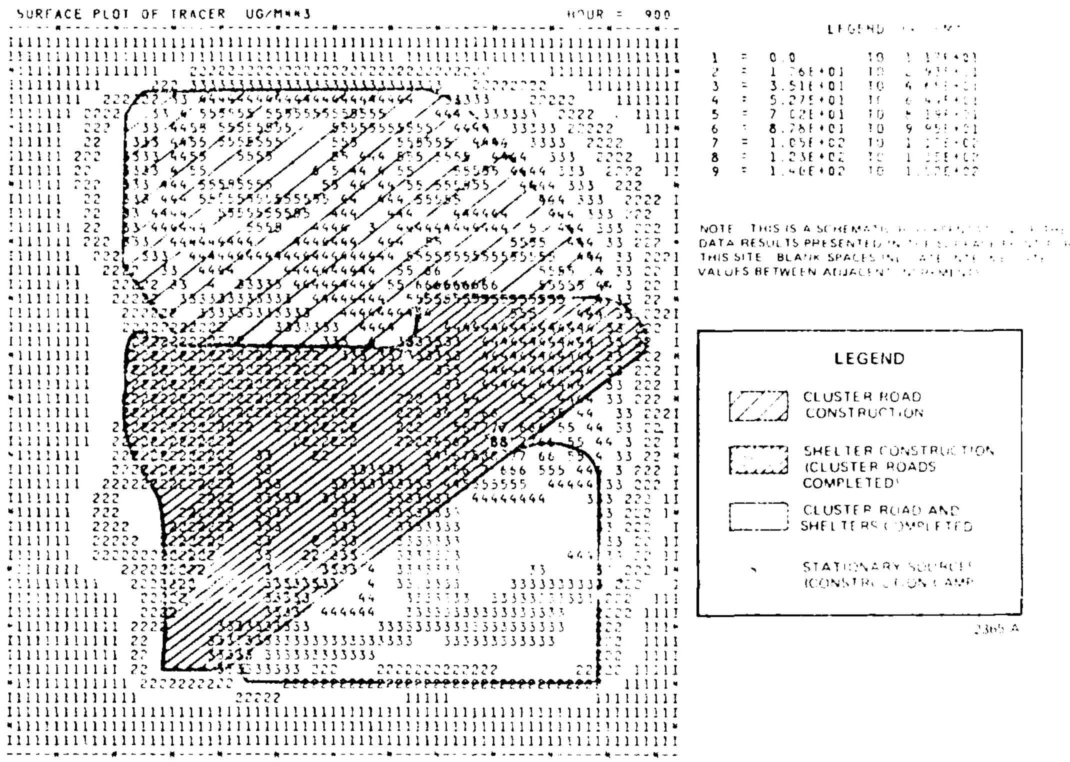


Figure 5.1.5-46. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dalhart area.

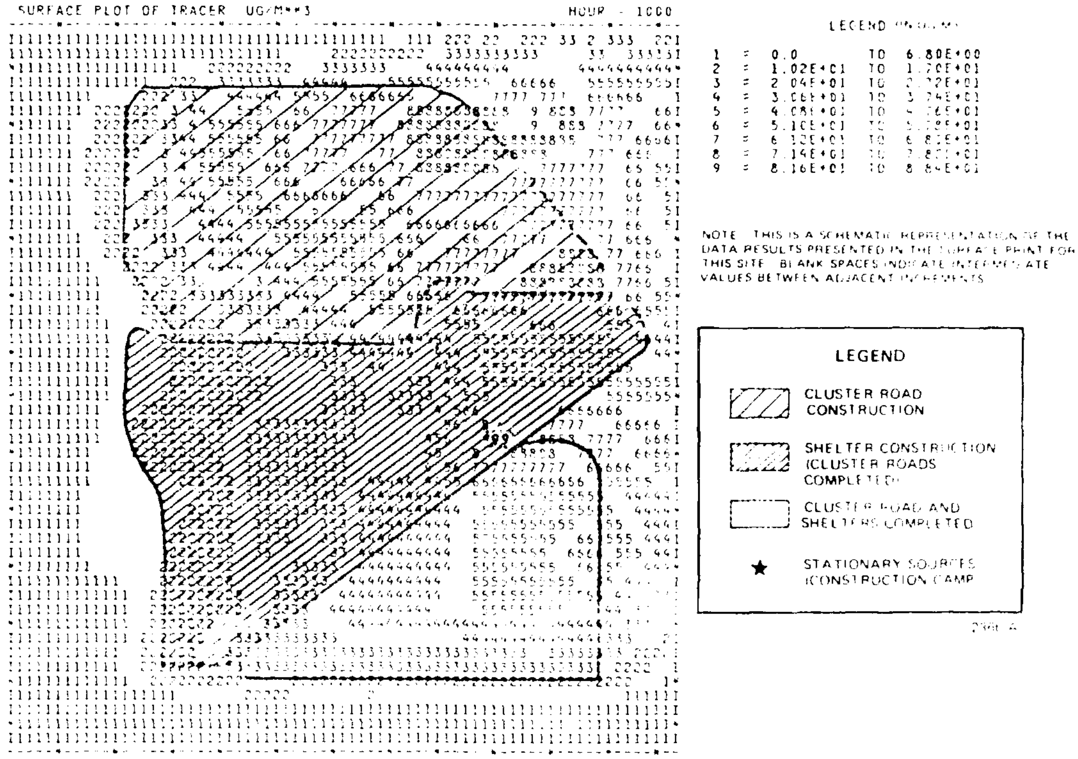
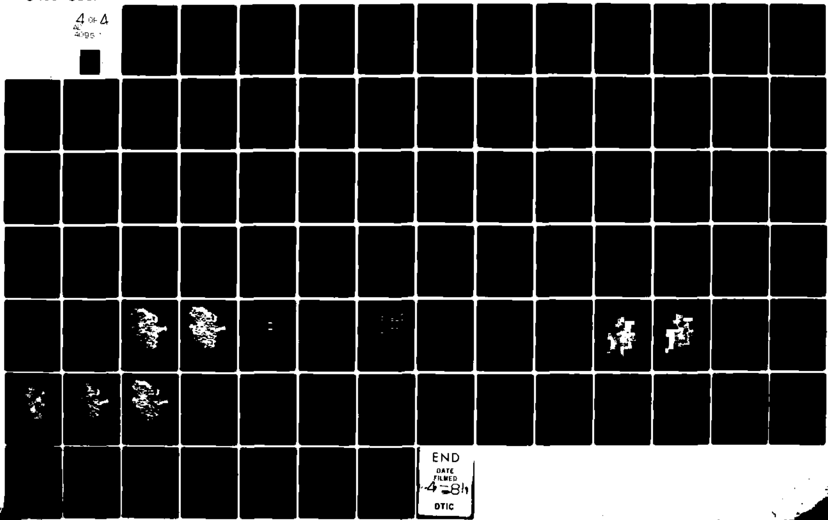


Figure 5.1.5-47. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dalhart area.

AD-A095 786 HENNINGSON DURHAM AND RICHARDSON SANTA BARBARA CA F/G 16/1
M-X ENVIRONMENTAL TECHNICAL REPORT. ENVIRONMENTAL CHARACTERISTI--ETC(U)
DEC 80 F04704-78-C-0029
UNCLASSIFIED M-X-ETR-13 AFSC-TR-81-28 NL



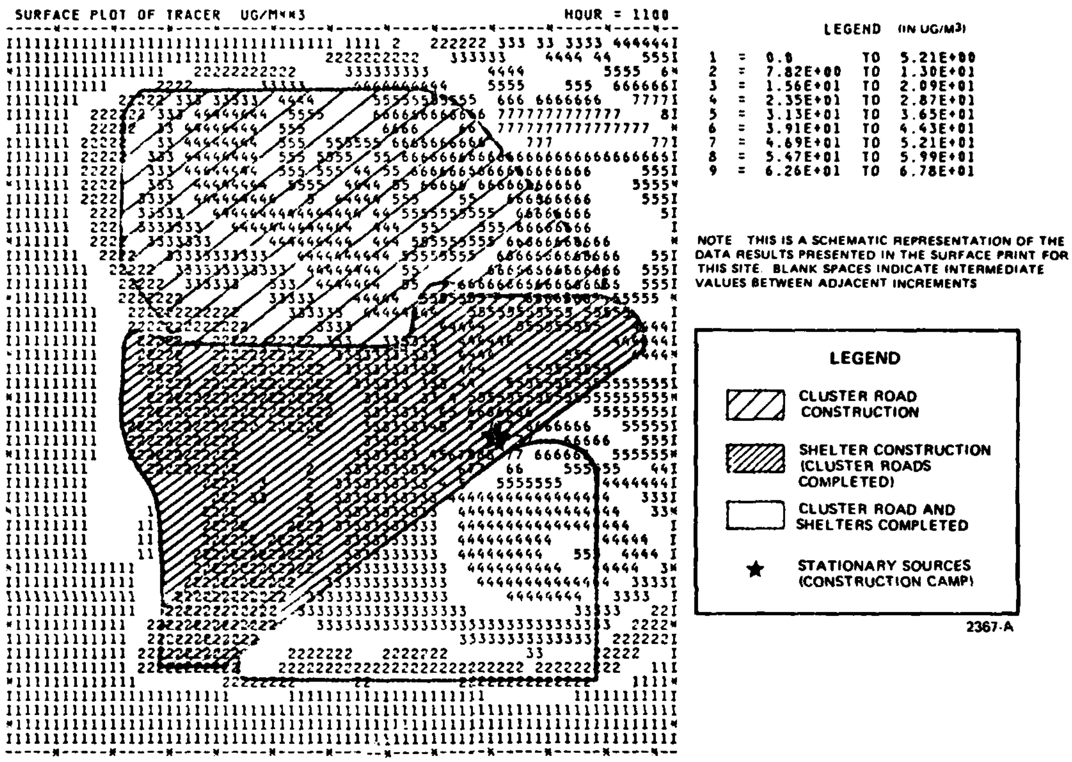


Figure 5.1.5-48. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Dalhart area.

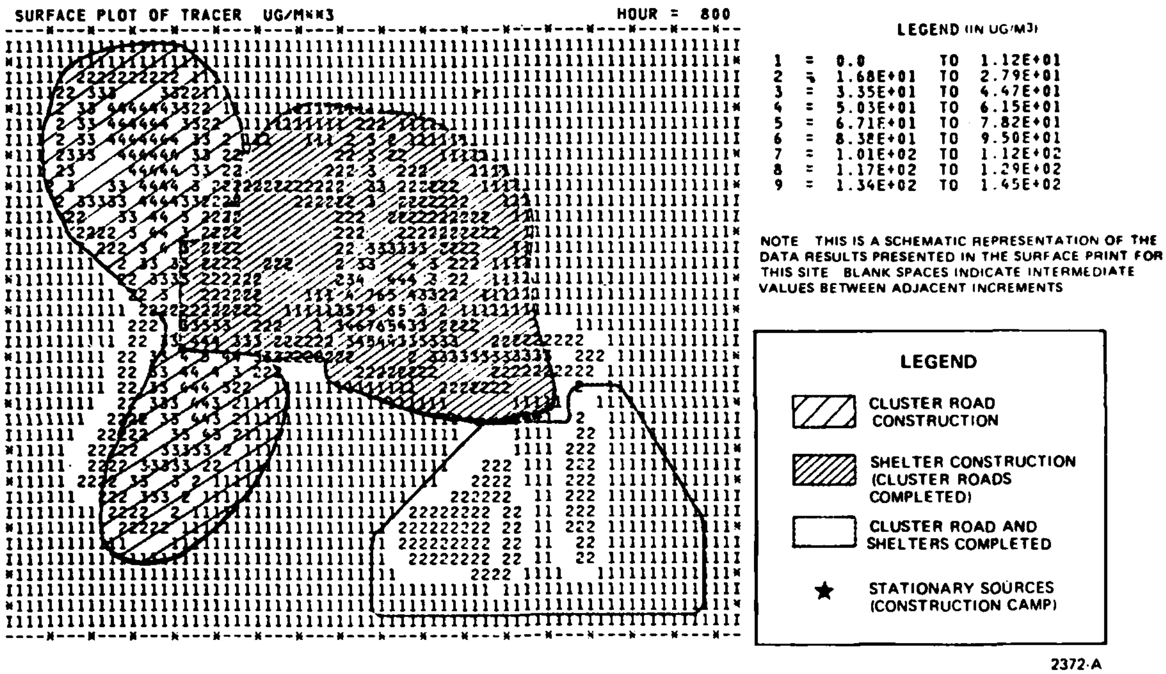


Figure 5.1.5-49. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Clovis area.

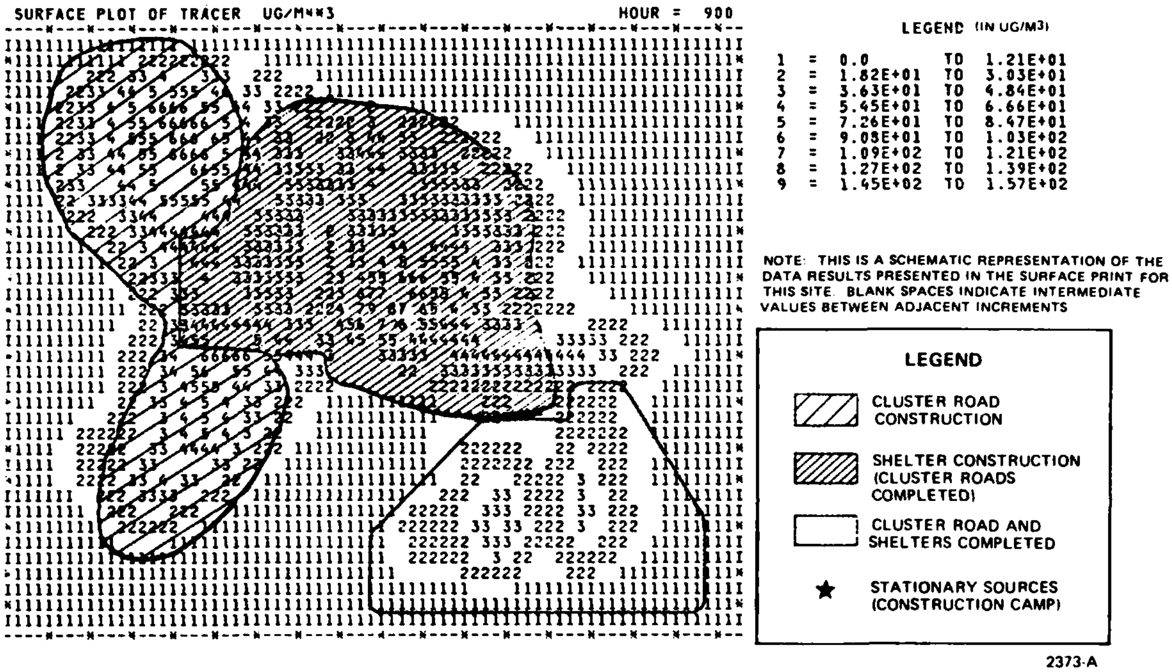


Figure 5.1.5-50. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Clovis area.

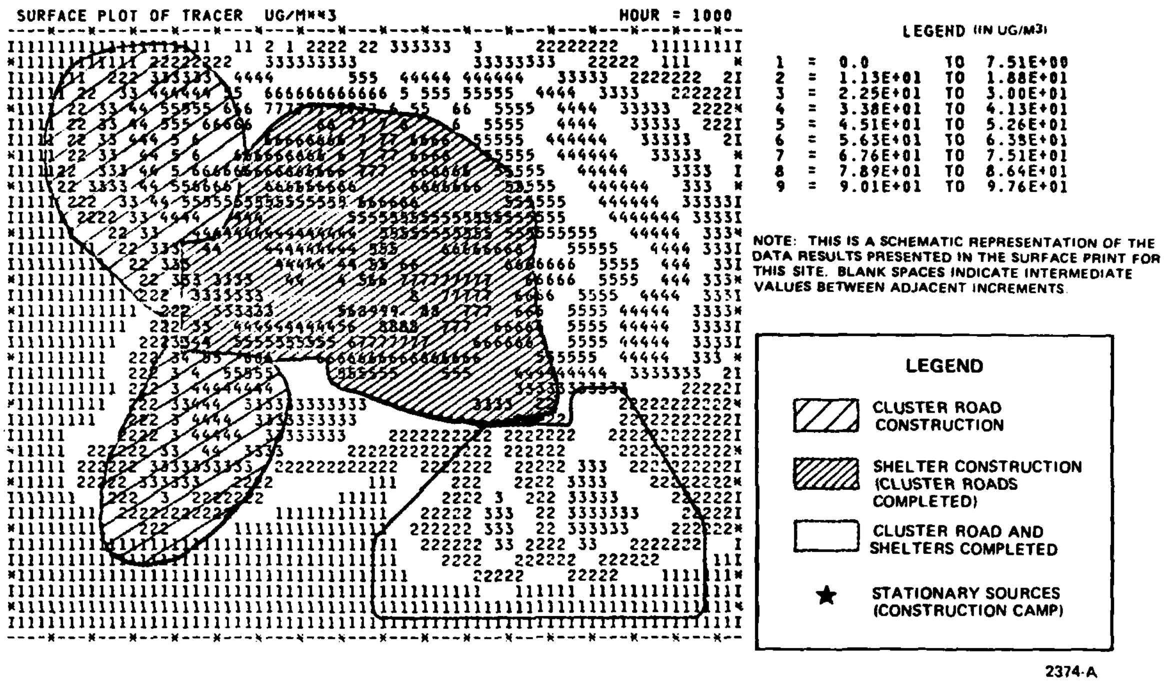


Figure 5.1.5-51. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Clovis area.

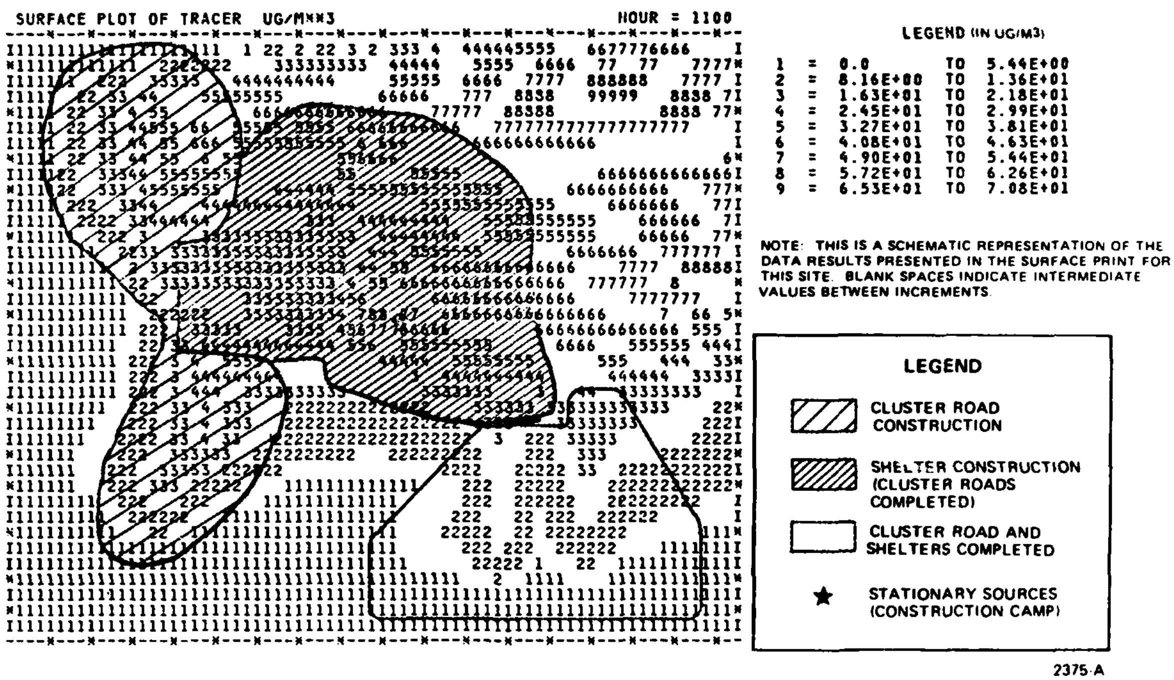


Figure 5.1.5-52. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Clovis area.

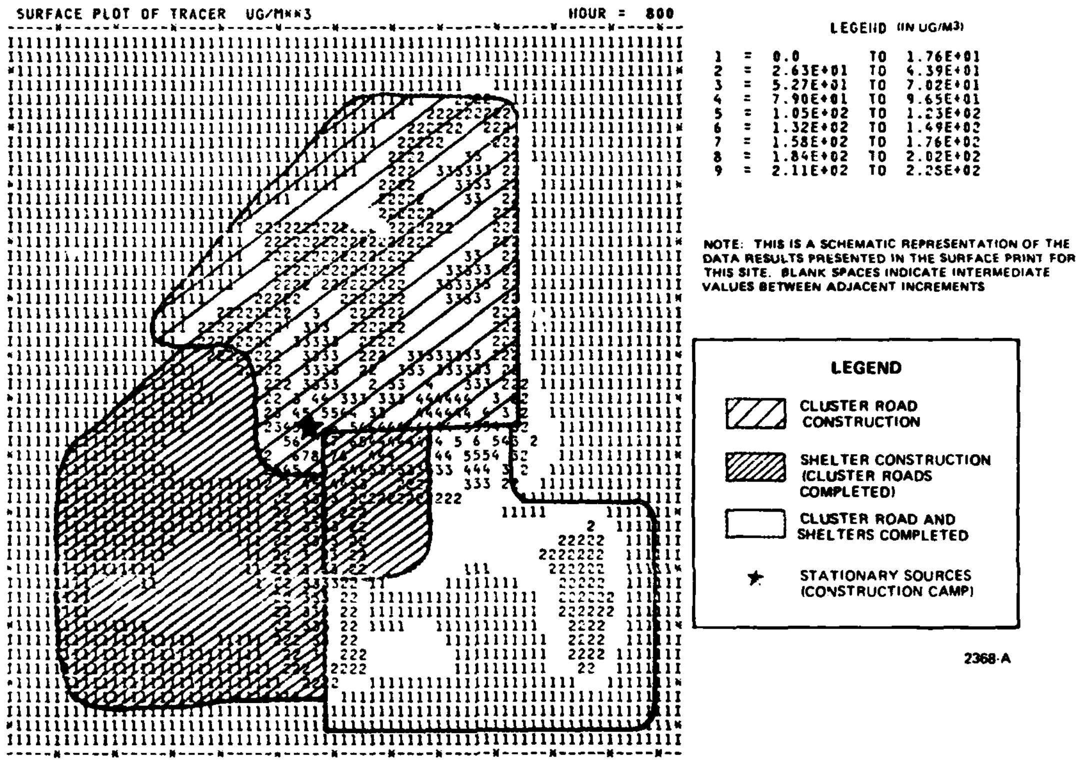


Figure 5.1.5-53. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Hereford area.

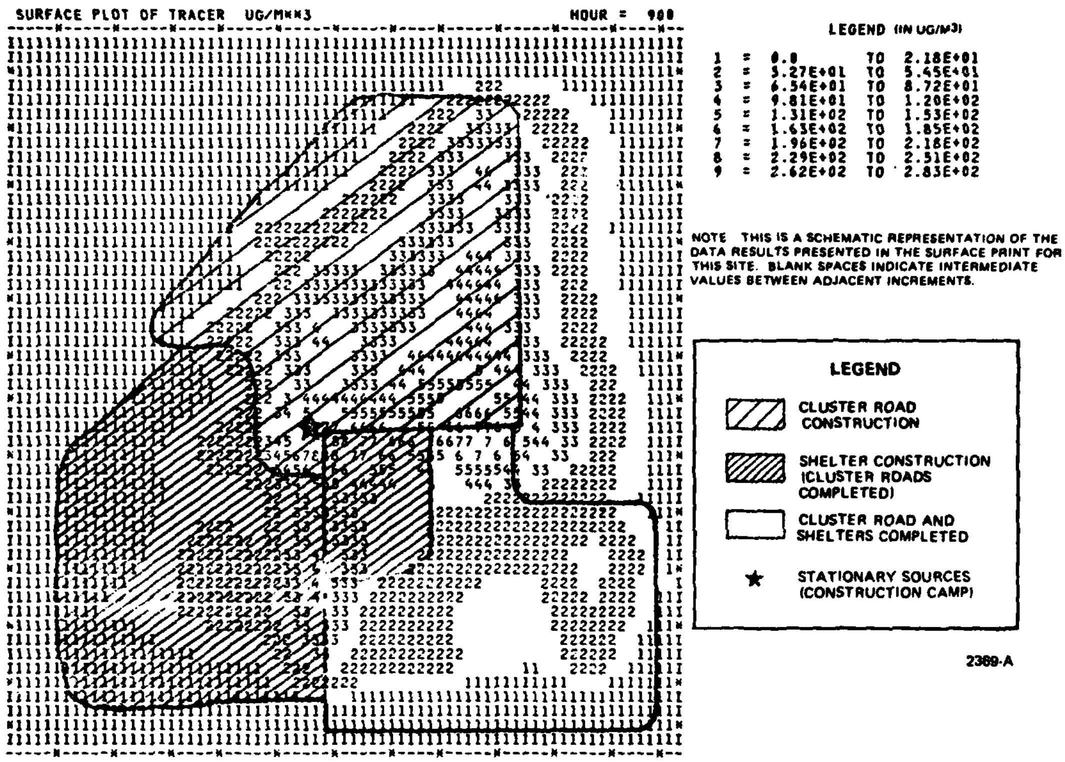


Figure 5.1.5-54. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Hereford area.

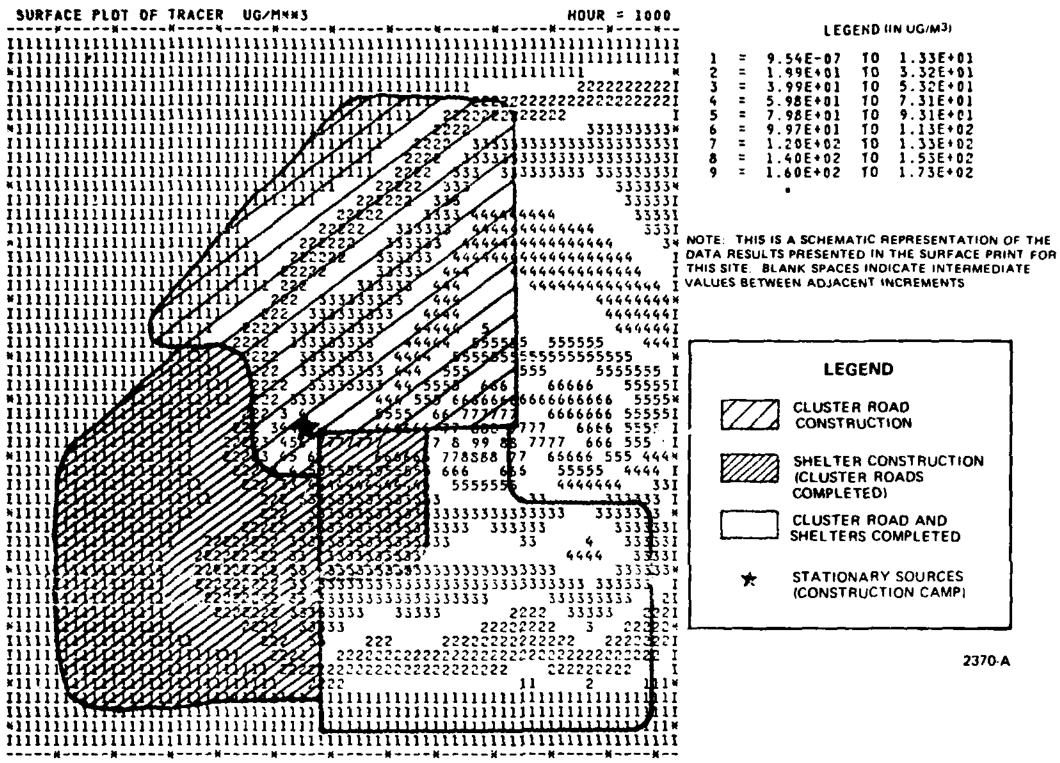


Figure 5.1.5-55. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Hereford area.

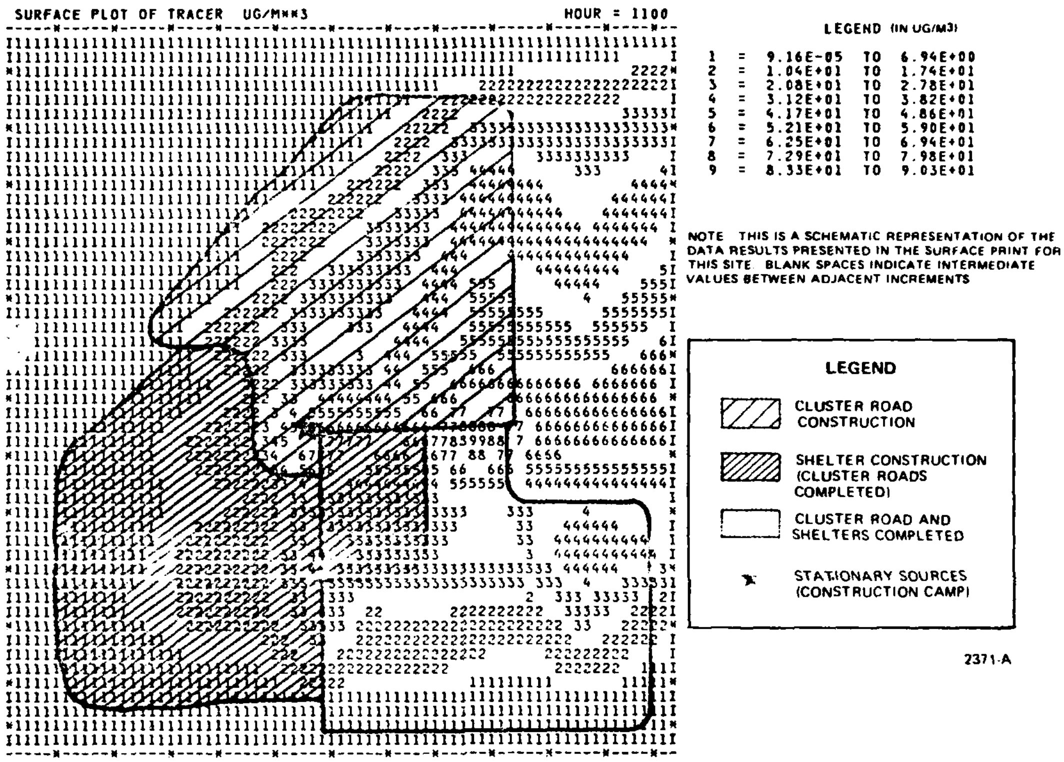


Figure 5.1.5-56. Predicted hourly particulate concentrations due to the construction of shelters and cluster roads in the Hereford area.

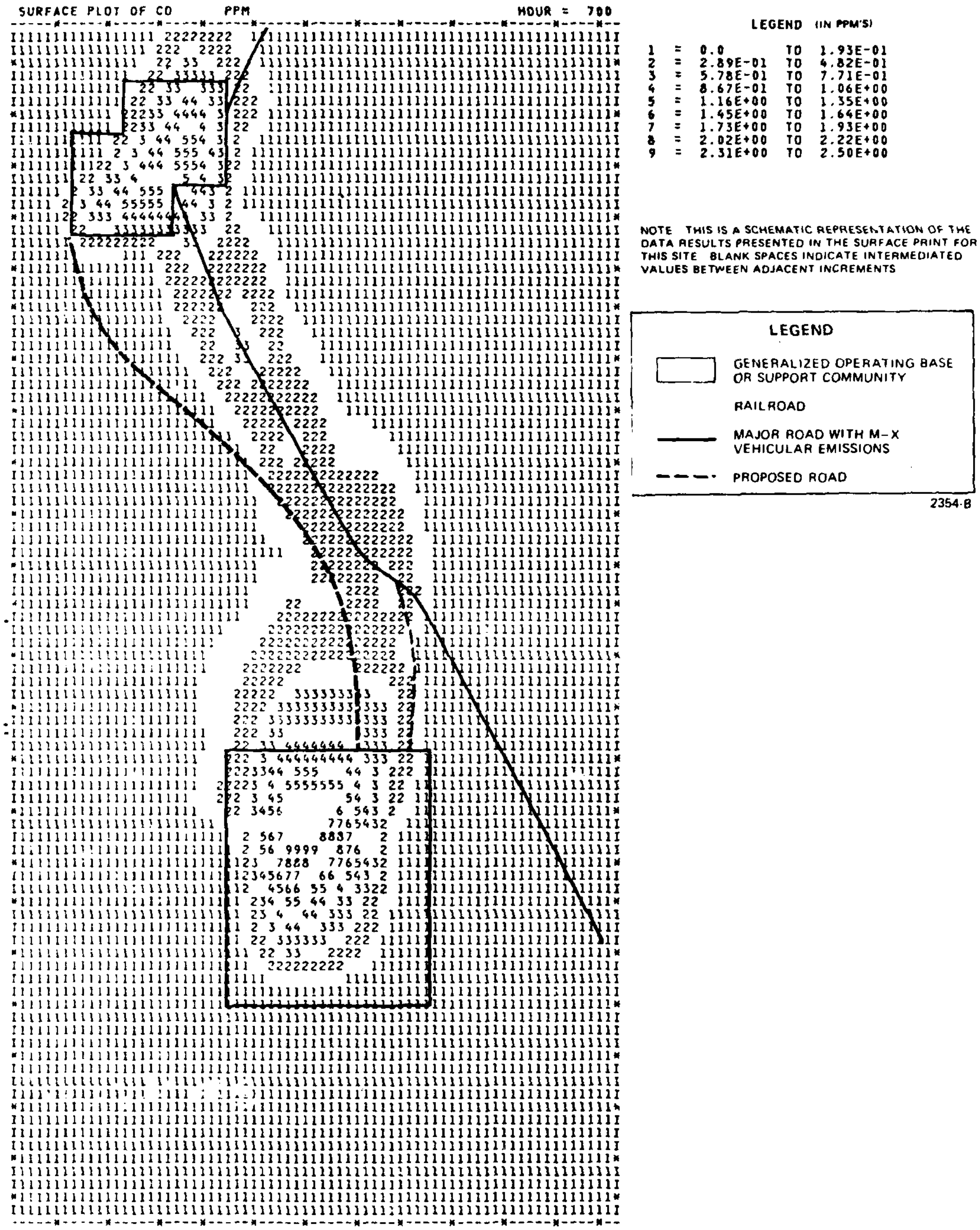


Figure 5.1.5-57. Predicted hourly CO concentrations at the Ely OB site and community.

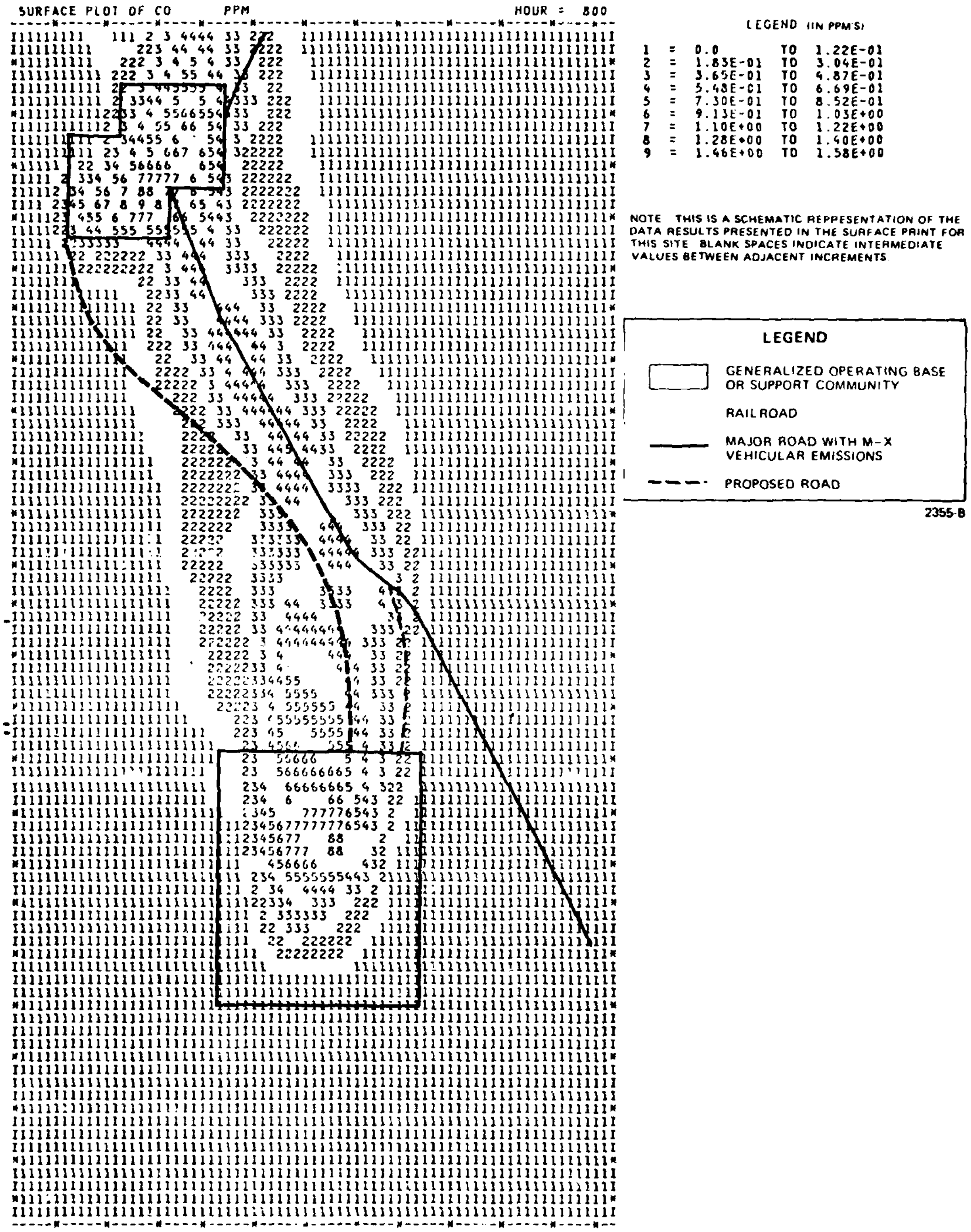


Figure 5.1.5-58. Predicted hourly CO concentrations at the Ely OB site and community.

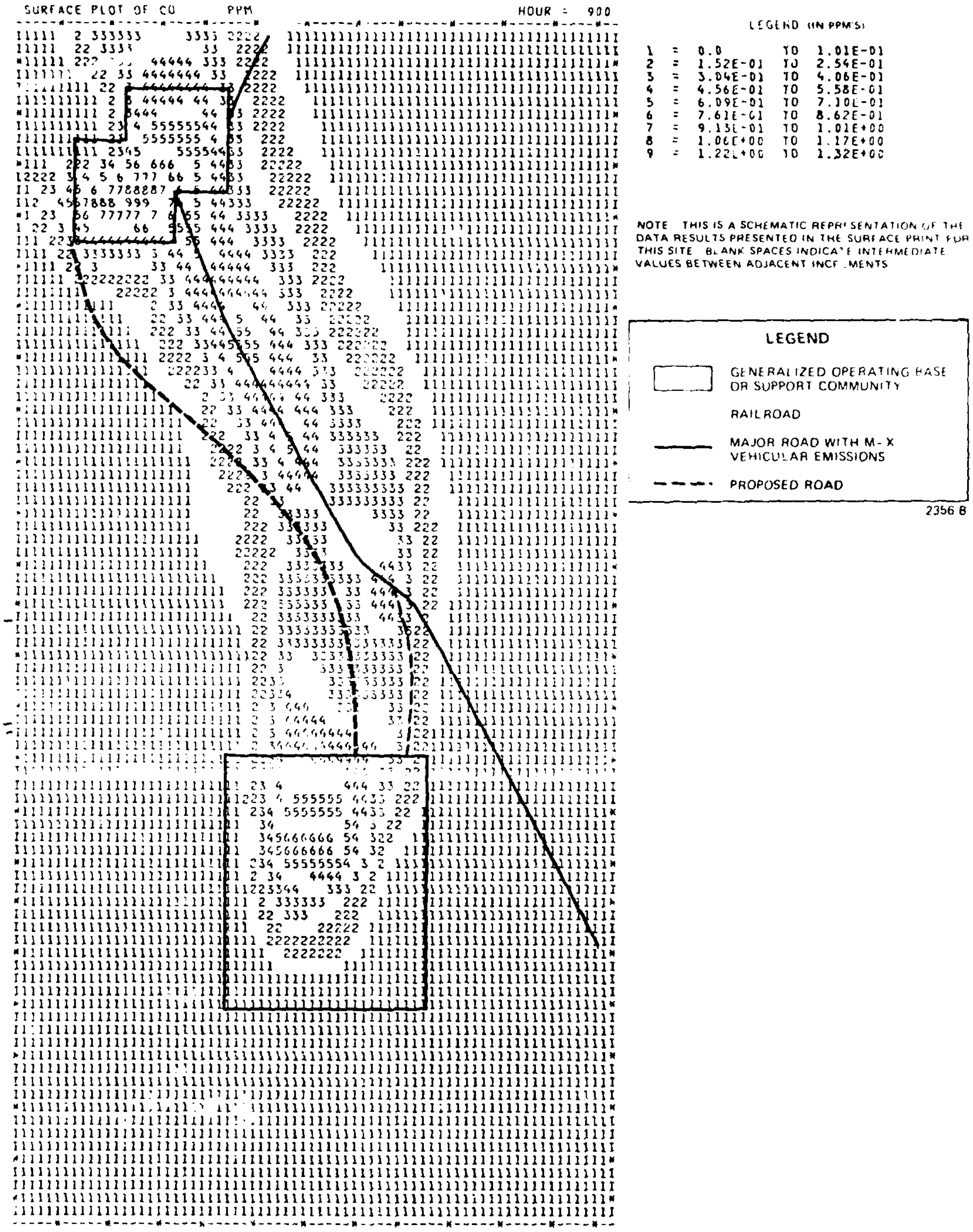


Figure 5.1.5-59. Predicted hourly CO concentrations at the Ely OB site and community.

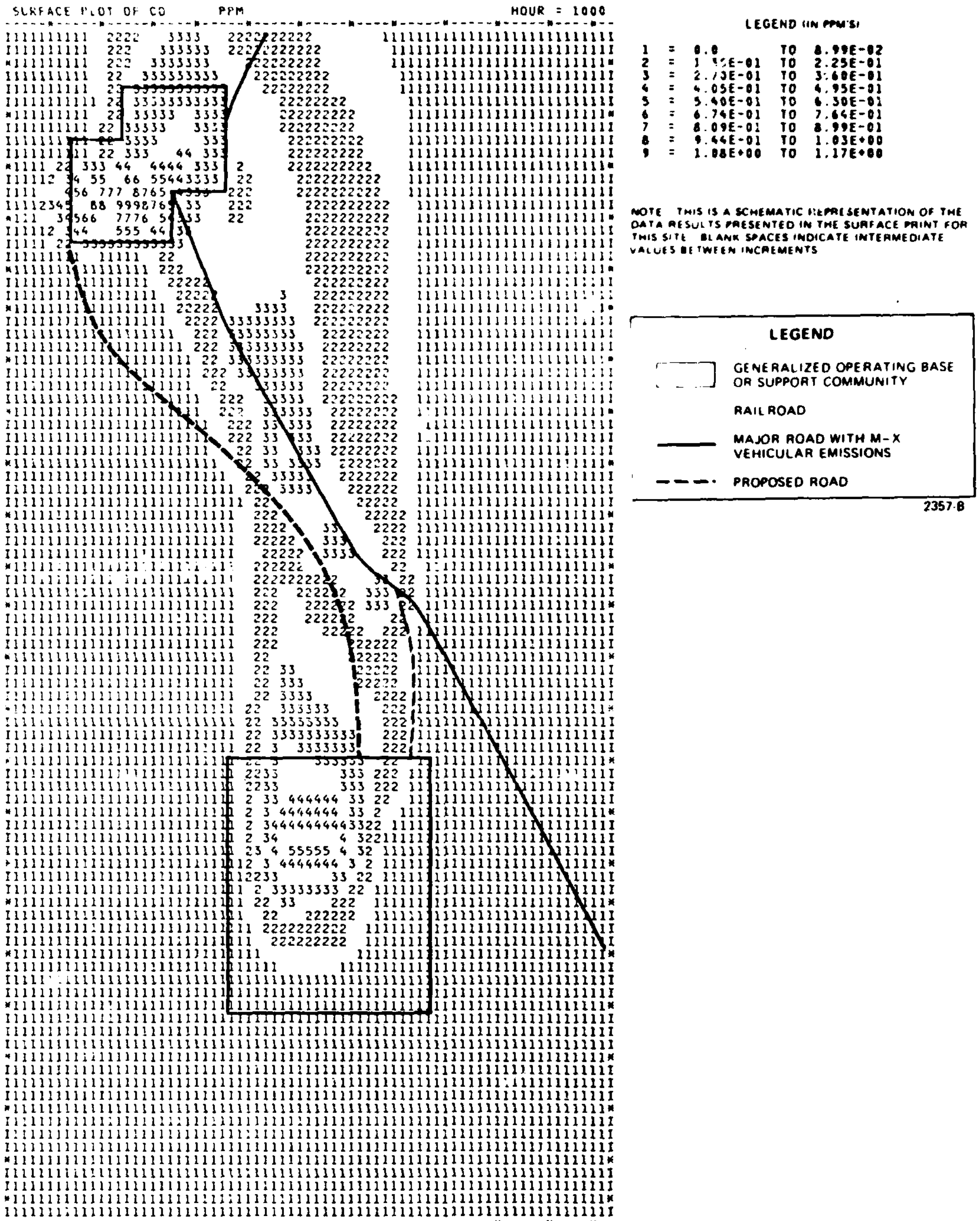


Figure 5.1.5-60. Predicted hourly CO concentrations at the Ely OB site and community.

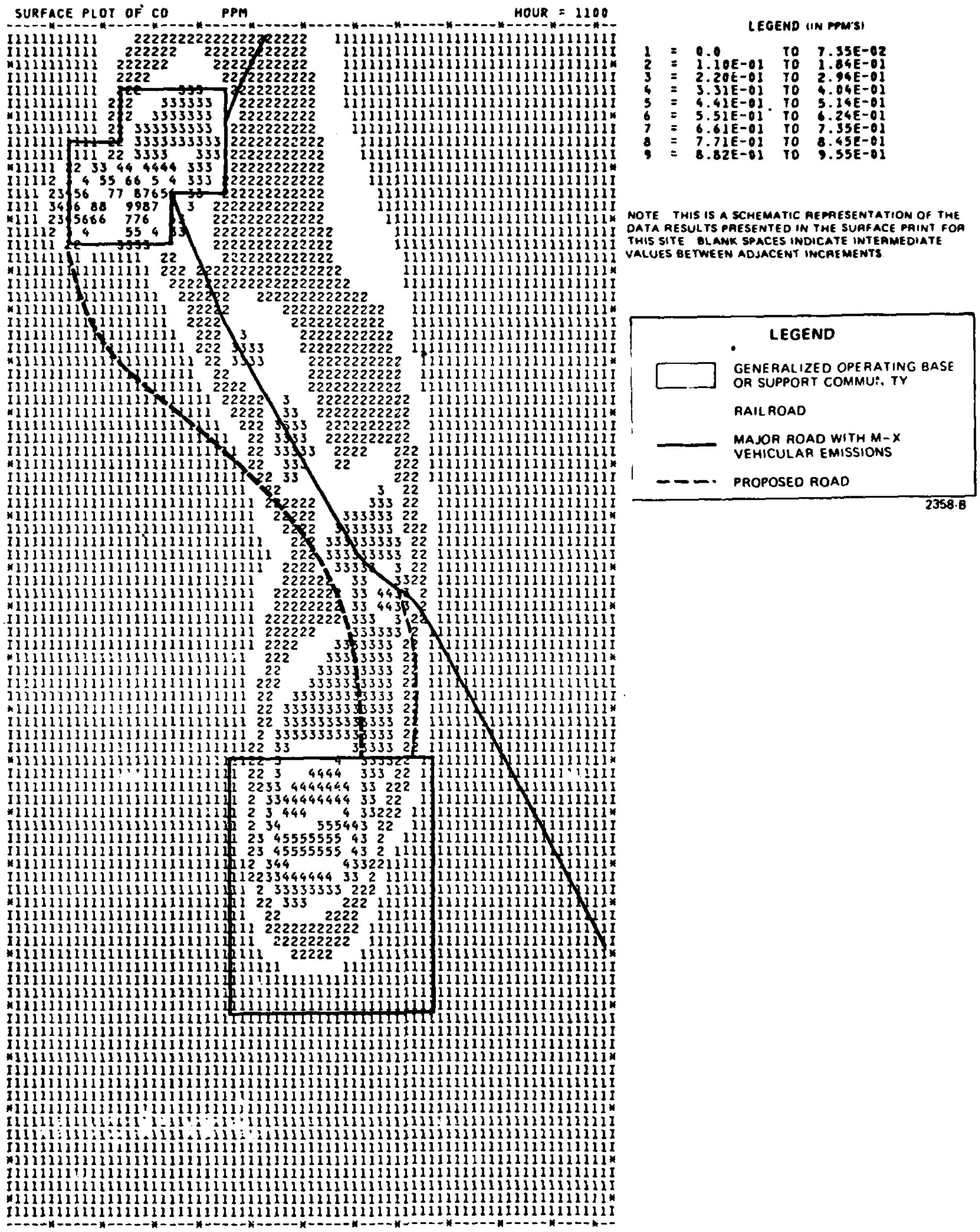


Figure 5.1.5-61. Predicted hourly CO concentrations at the Ely OB site and community.

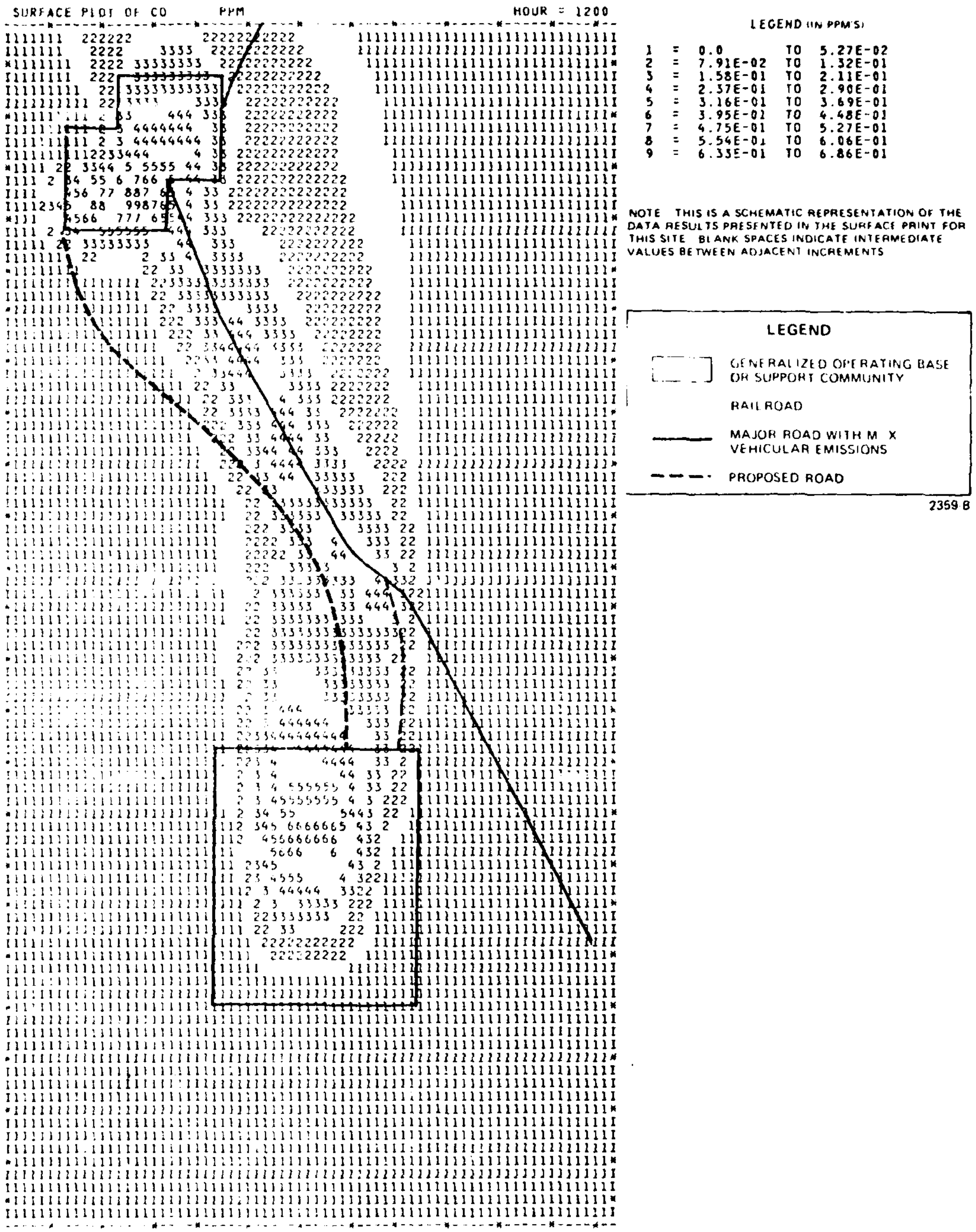


Figure 5.1.5-62. Predicted hourly CO concentrations at the Ely OB site and community.

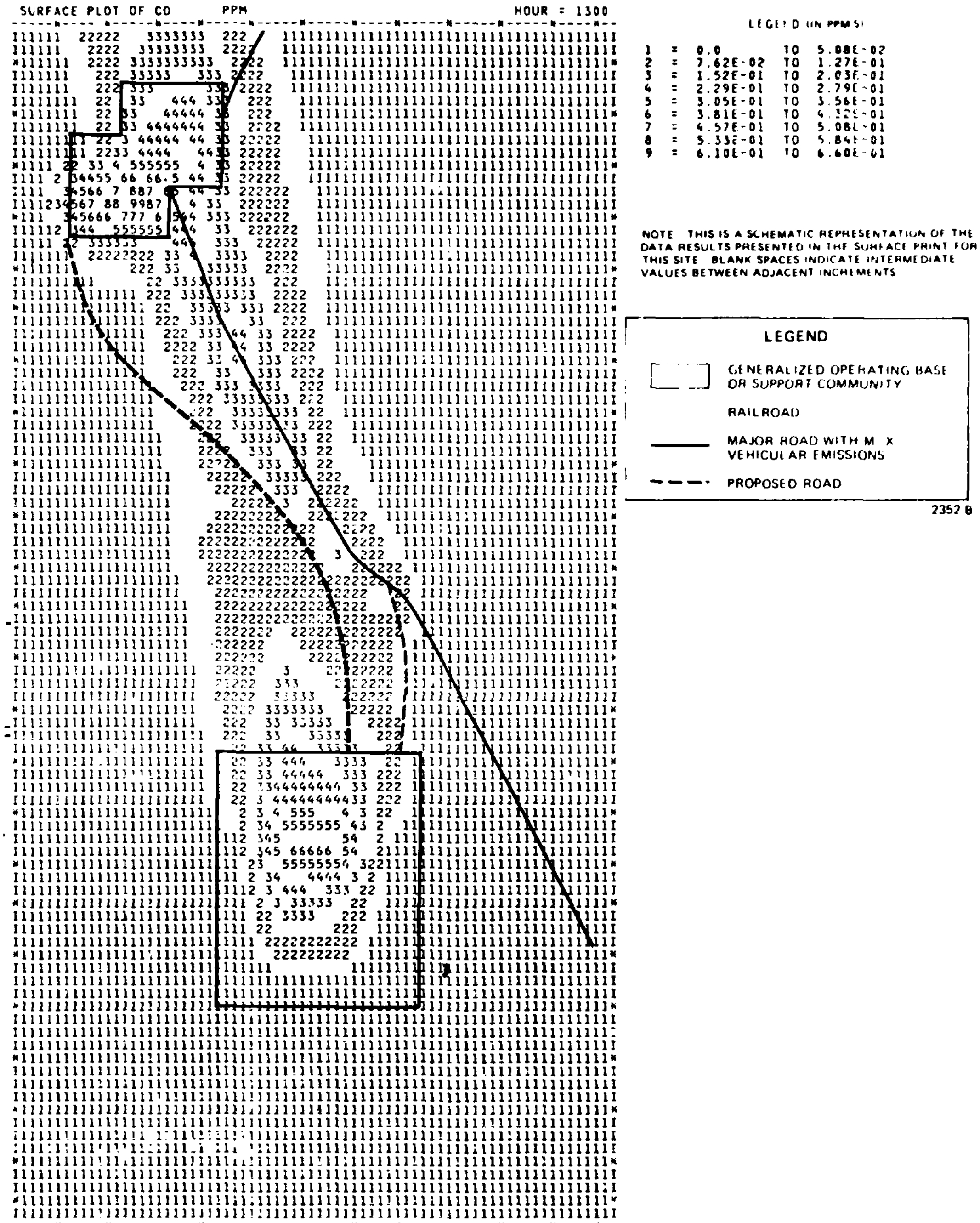


Figure 5.1.5-63. Predicted hourly CO concentrations at the Ely OB site and community.

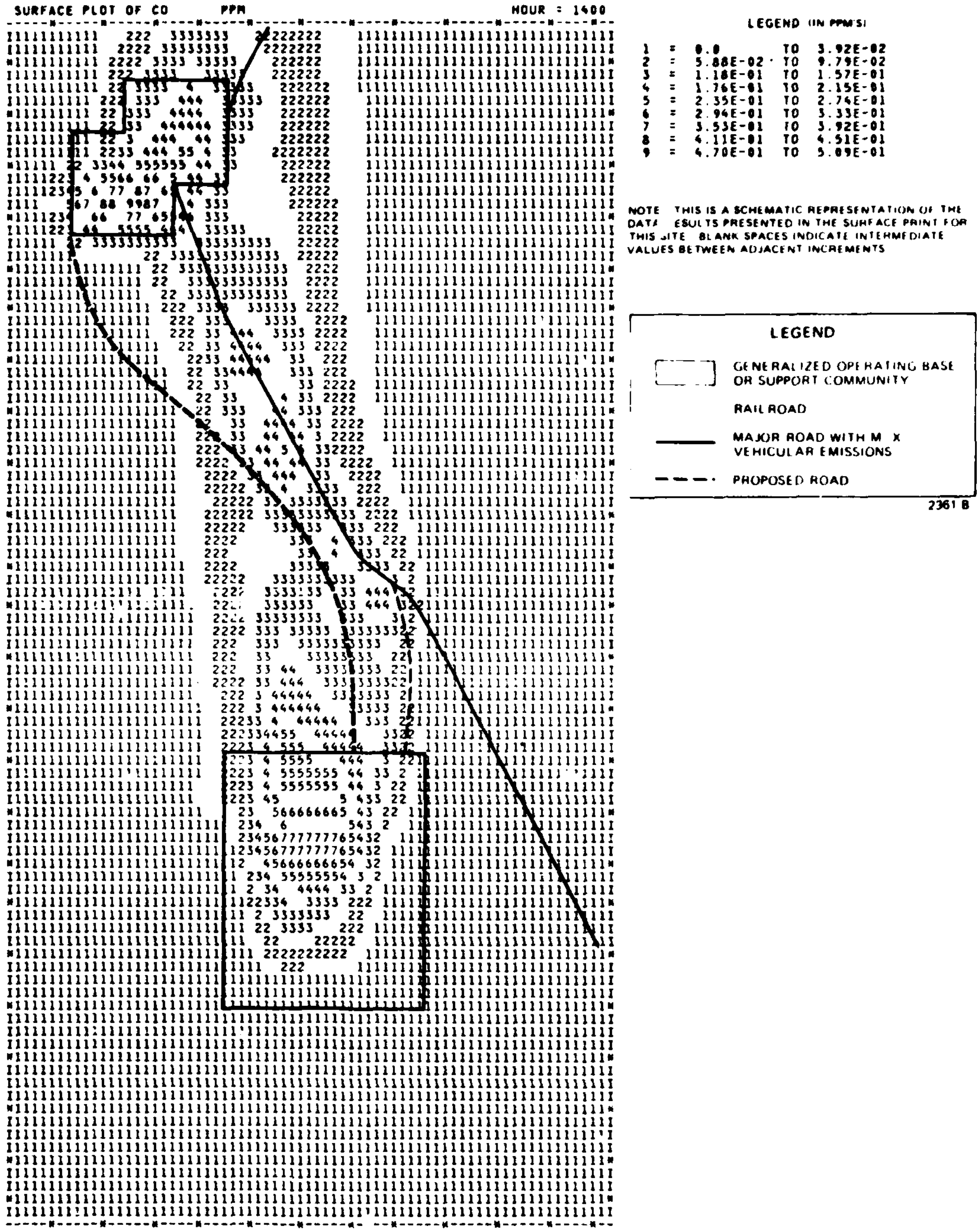
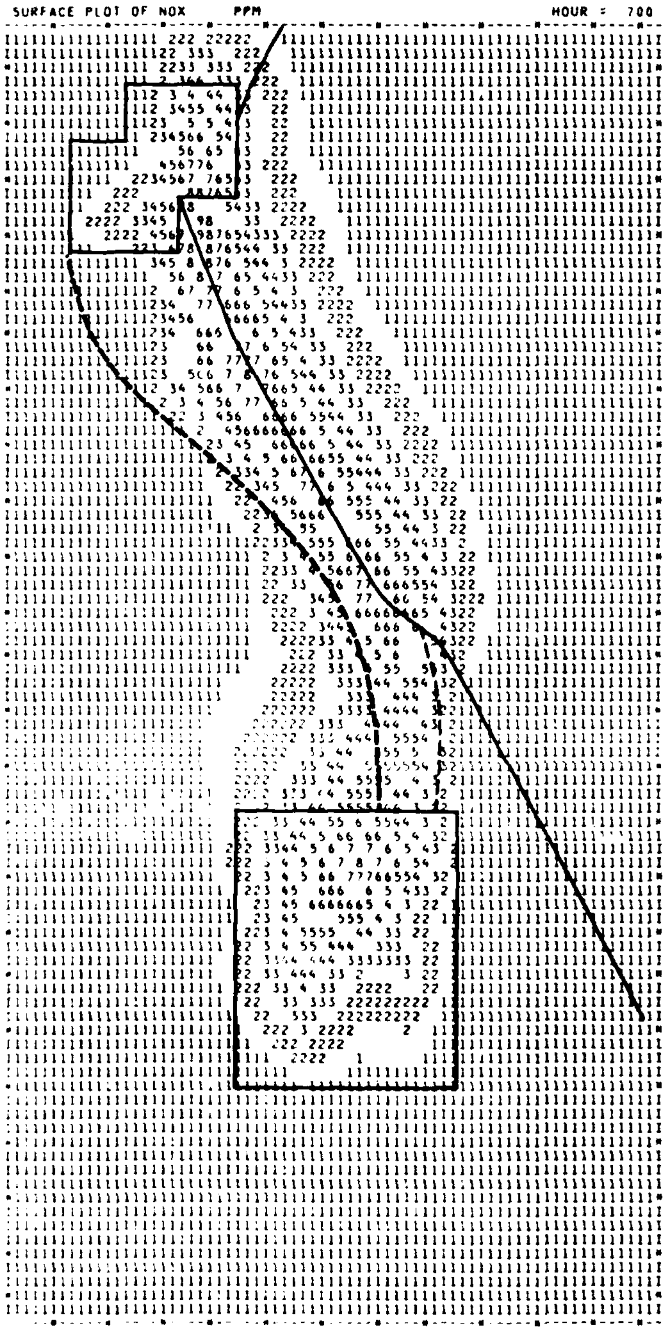


Figure 5.1.5-64. Predicted hourly CO concentrations at the Ely OB site and community.



LEGEND (IN PPM'S)

1	=	0.0	TO	1.01E-02
2	=	1.51E-02	TO	2.52E-02
3	=	3.02E-02	TO	4.03E-02
4	=	4.53E-02	TO	5.54E-02
5	=	6.04E-02	TO	7.05E-02
6	=	7.55E-02	TO	8.56E-02
7	=	9.06E-02	TO	1.01E-01
8	=	1.06E-01	TO	1.16E-01
9	=	1.21E-01	TO	1.31E-01

NOTE THIS IS A SCHEMATIC REPRESENTATION OF THE DATA RESULTS PRESENTED IN THE SURFACE PRINT FOR THIS SITE BLANK SPACES INDICATE INTERMEDIATE VALUES BETWEEN ADJACENT INCREMENTS

LEGEND

GENERALIZED OPERATING BASE OR SUPPORT COMMUNITY

RAILROAD

MAJOR ROAD WITH MAX VEHICULAR EMISSIONS

PROPOSED ROAD

2346 B

Figure 5.1.5-65. Predicted hourly NO_x concentrations at the Ely OB site and community.

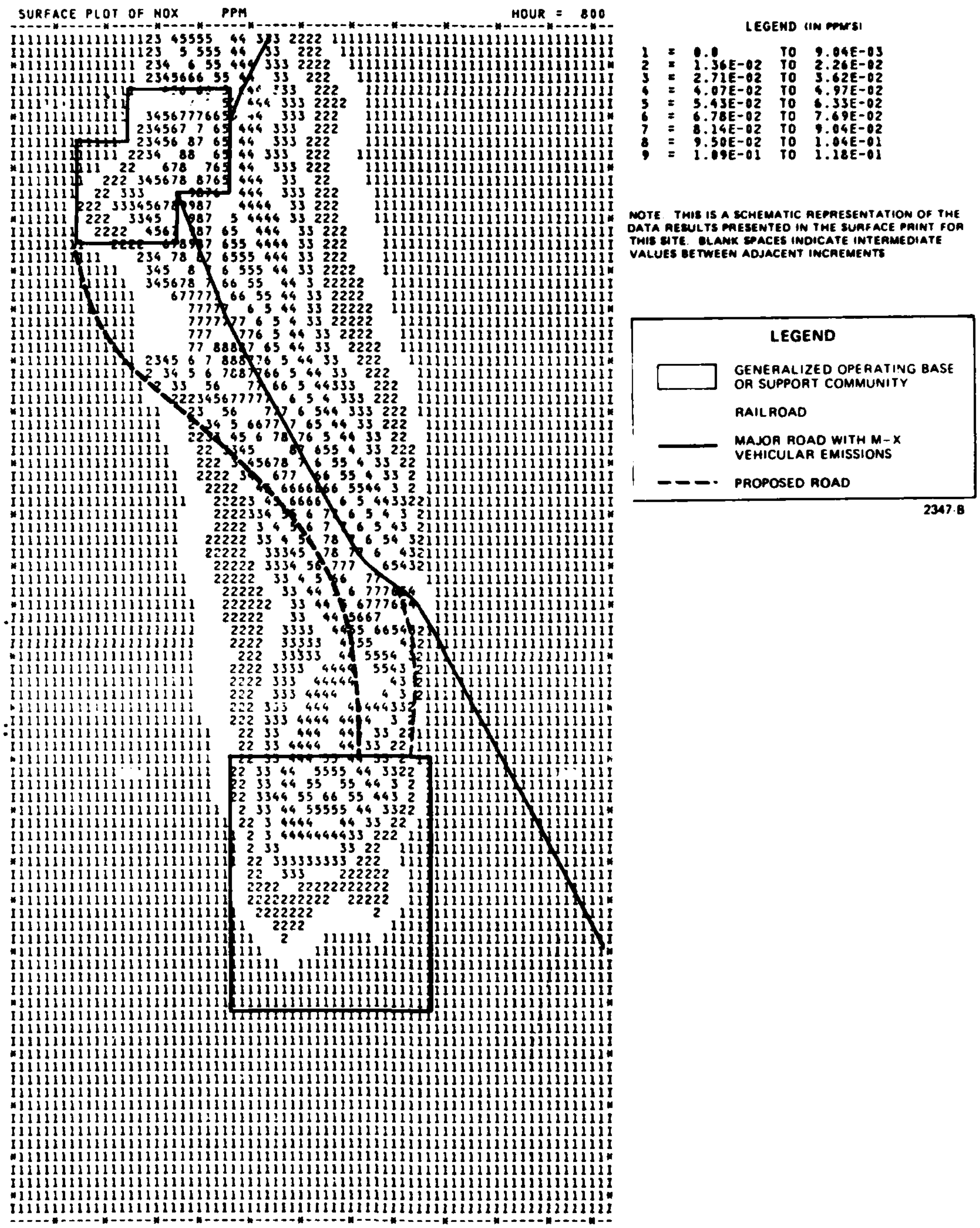


Figure 5.1.5-66. Predicted hourly NO_x concentrations at the Ely OB site and community.

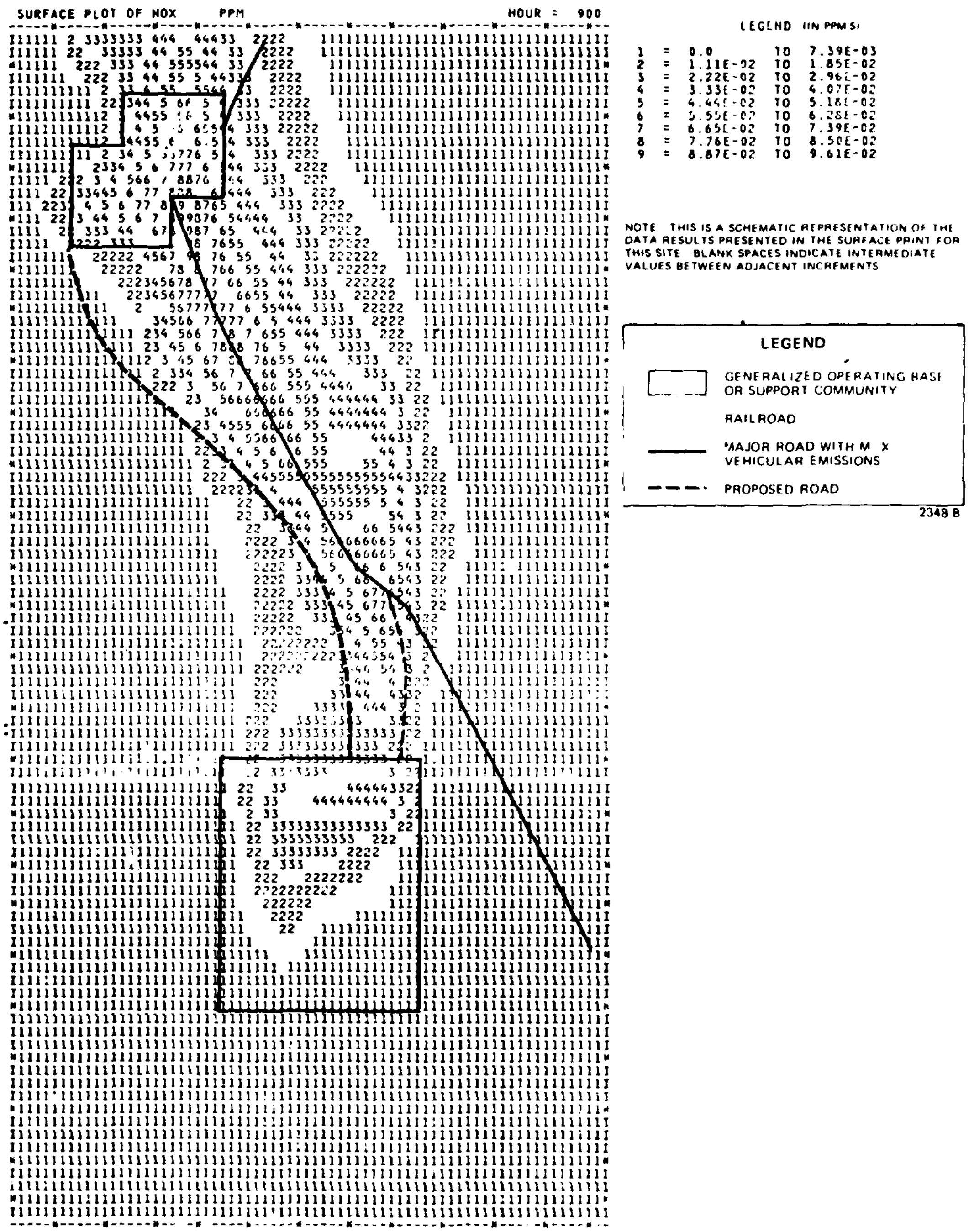


Figure 5.1.5-67. Predicted hourly NO_x concentrations at the Ely OB site and community.

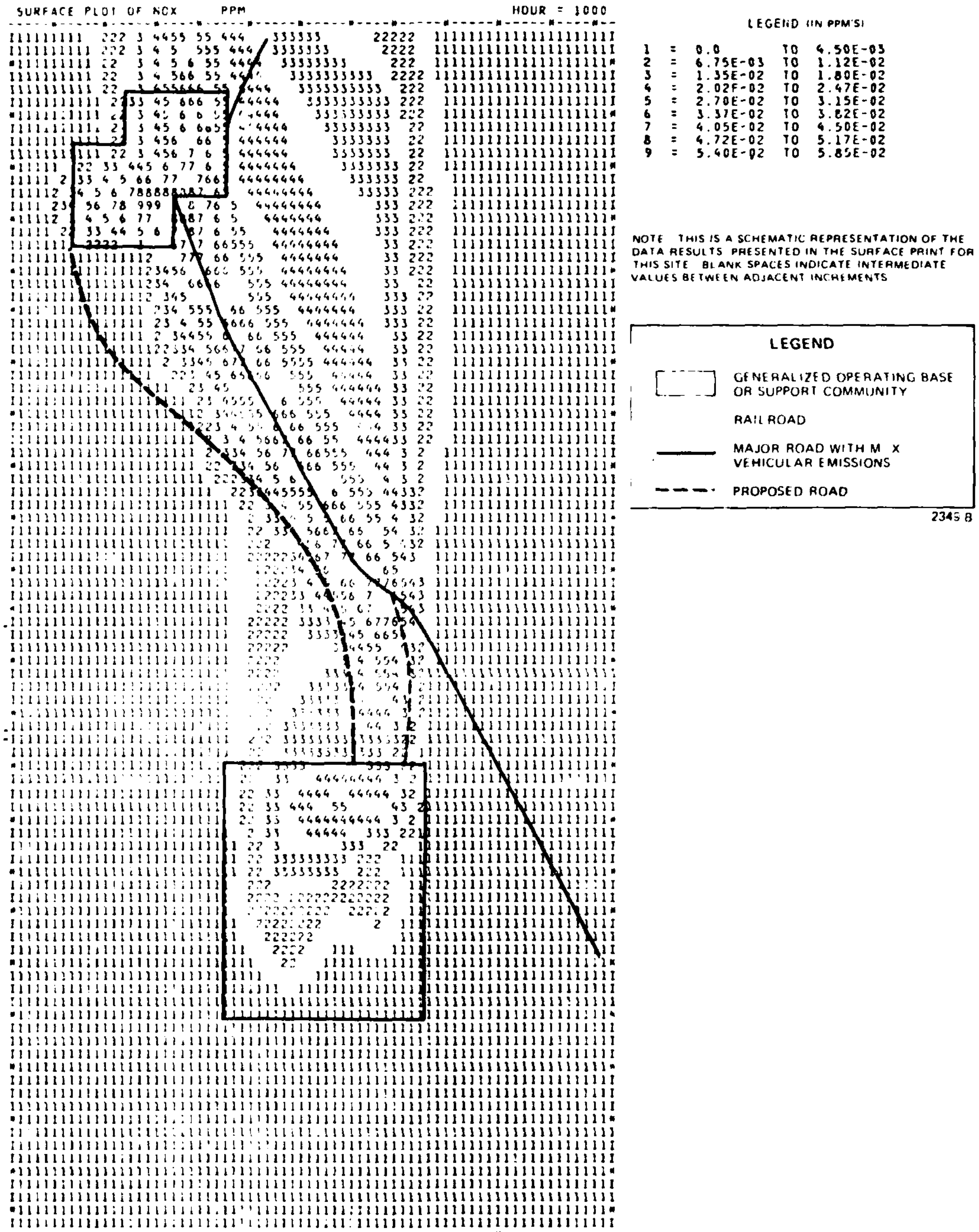


Figure 5.1.5-68. Predicted hourly NO_x concentrations at the Ely OB site and community.

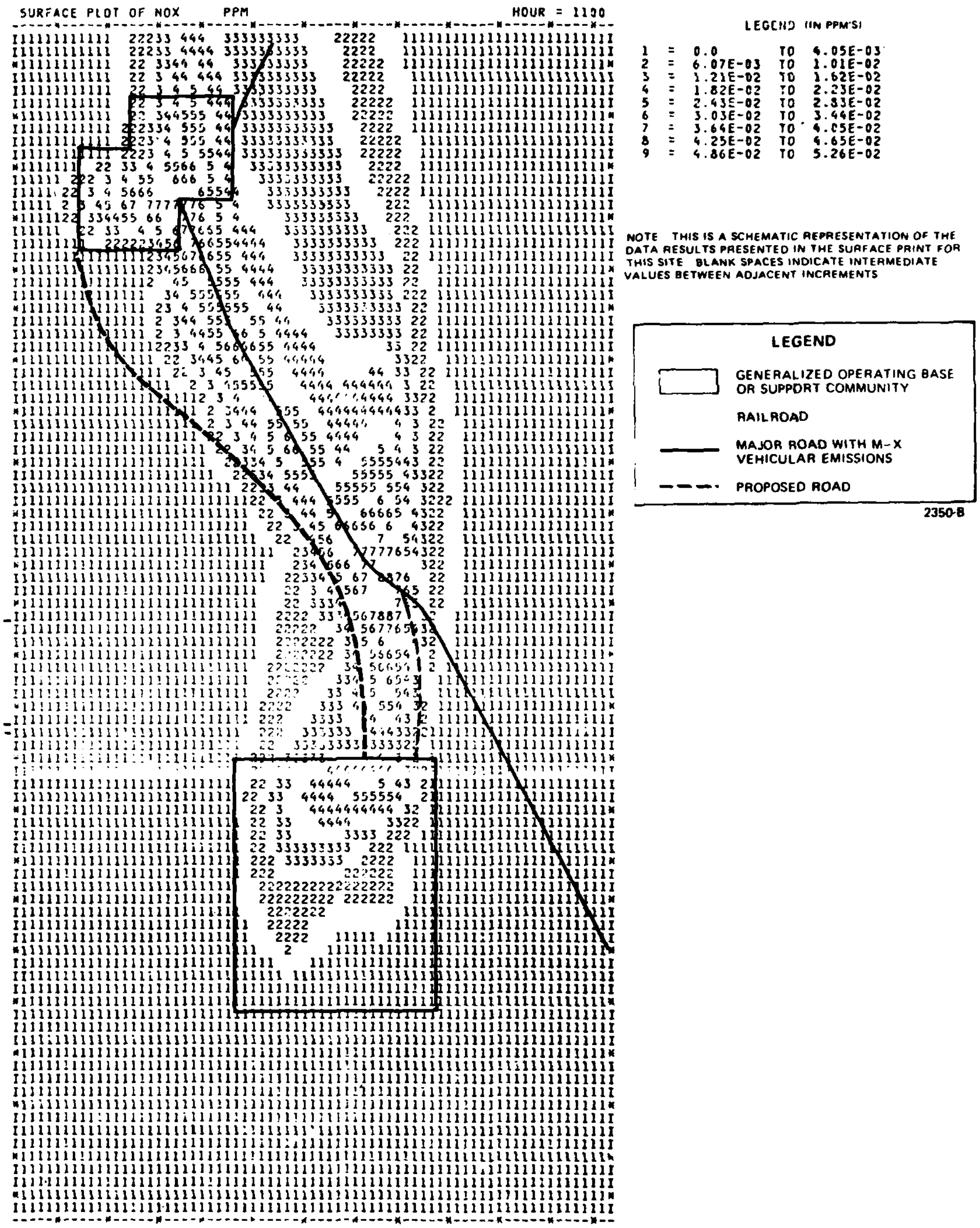


Figure 5.1.5-69. Predicted hourly NO_x concentrations at the Ely OB site and community.

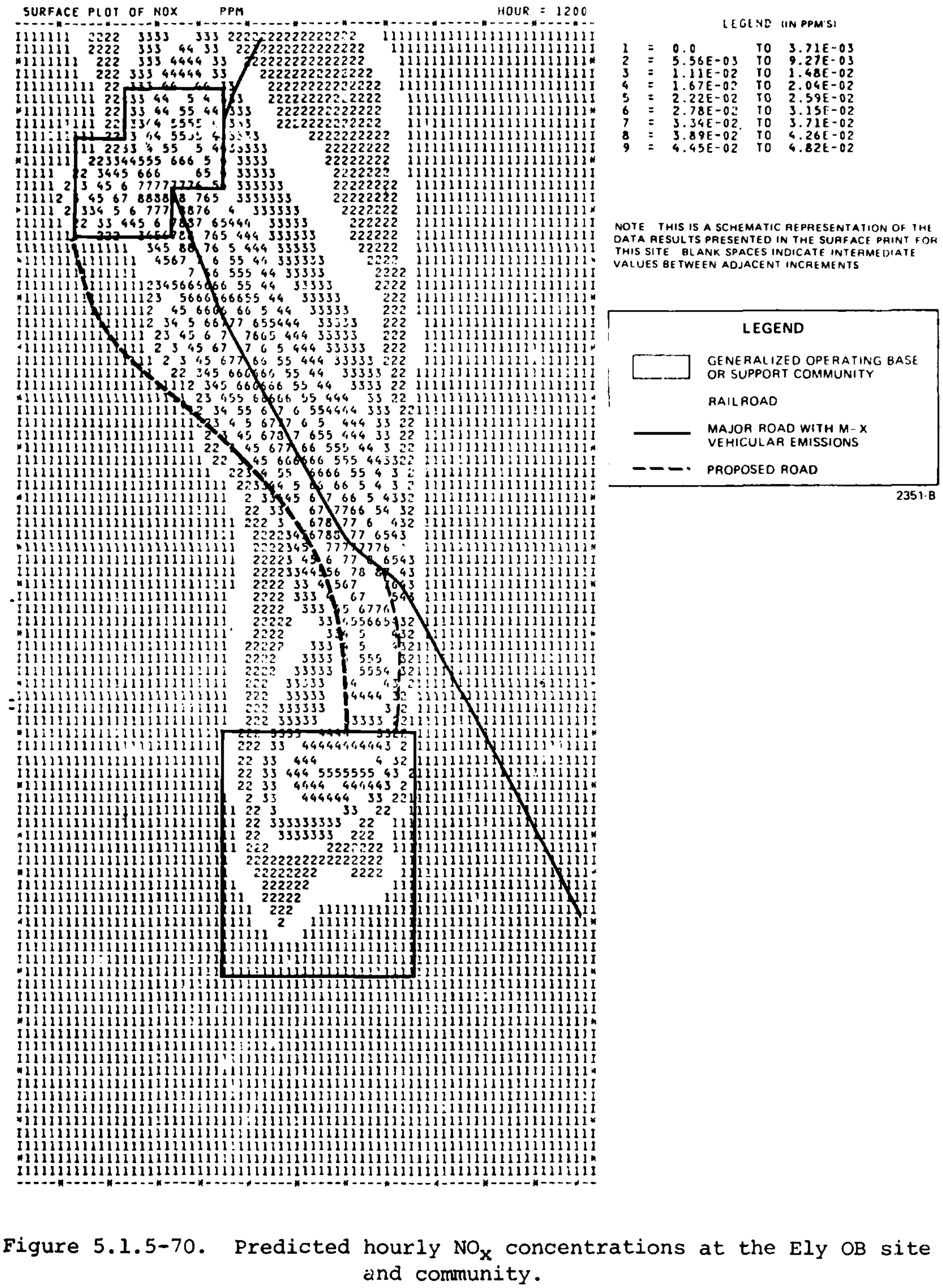


Figure 5.1.5-70. Predicted hourly NO_x concentrations at the Ely OB site and community.

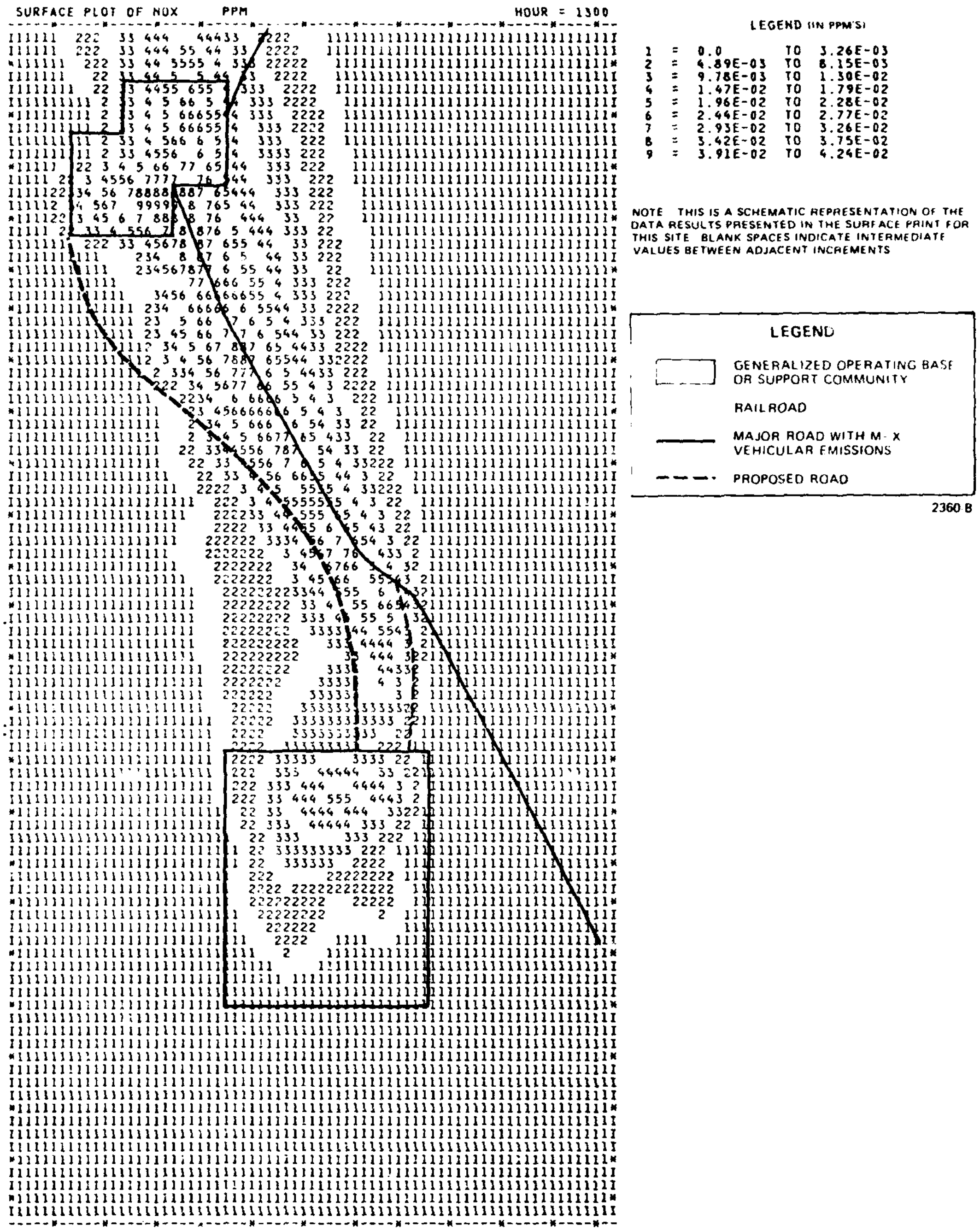


Figure 5.1.5-71. Predicted hourly NO_x concentrations at the Ely OB site and community.

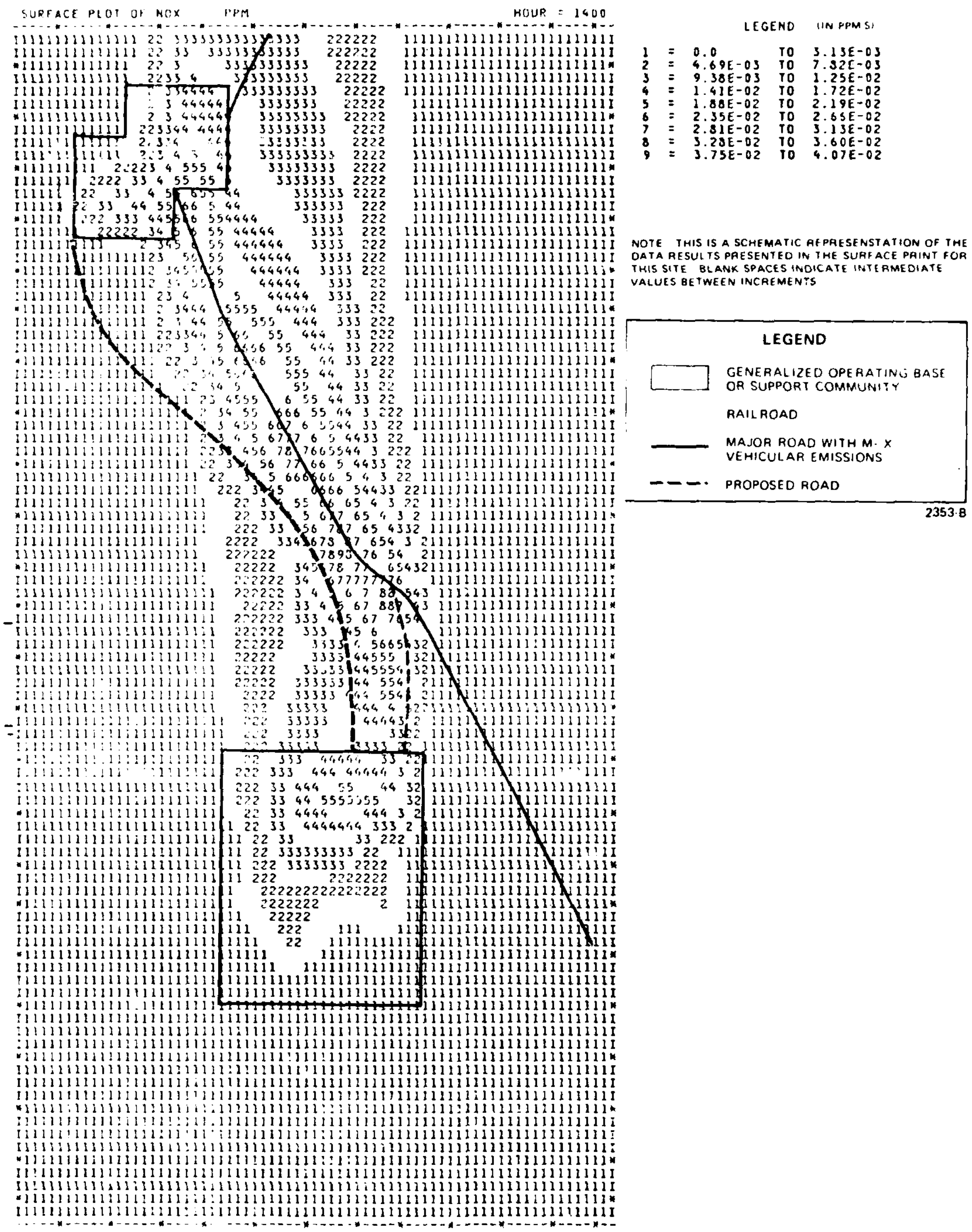
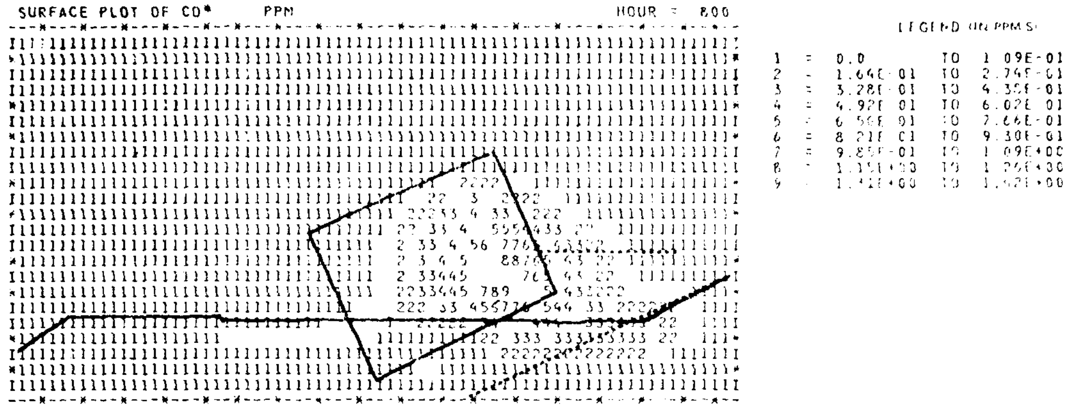
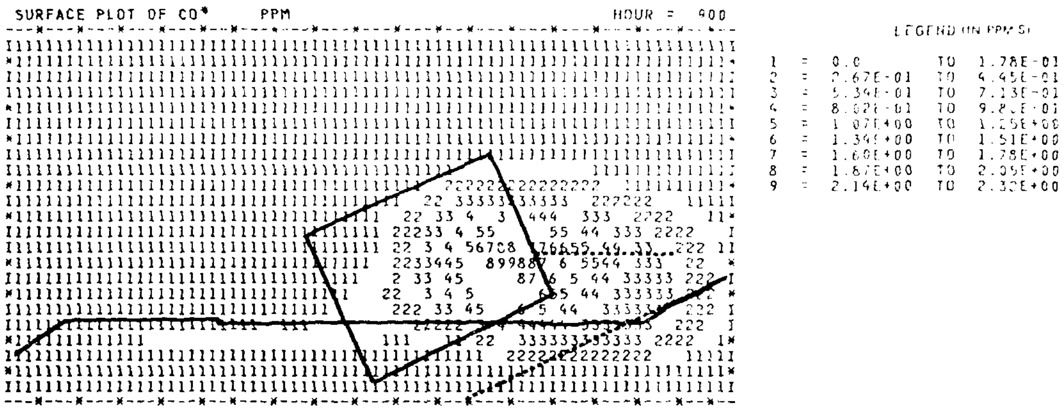


Figure 5.1.5-72. Predicted hourly NO_x concentrations at the Ely OB site and community.





*NOTE: THIS IS A SCHEMATIC REPRESENTATION OF THE DATA RESULTS PRESENTED IN THE SURFACE PRINT FOR THIS SITE. BLANK SPACES INDICATE INTERMEDIATE VALUES BETWEEN ADJACENT INCREMENTS.

2215 1 A

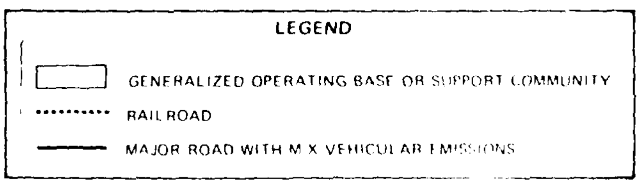
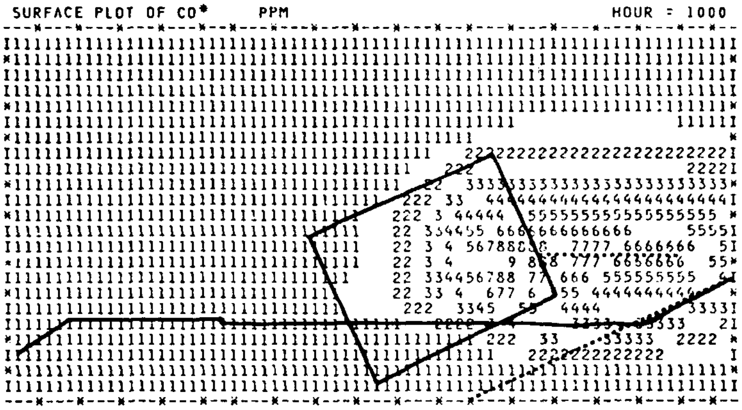
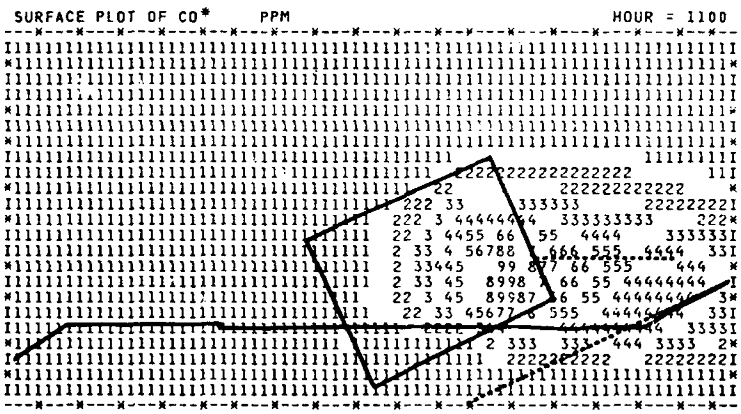


Figure 5.1.5-73. Predicted hourly CO concentrations at the Beryl OB site.



LEGEND (IN PPM'S)

1	=	0.0	TO	5.39E-02
2	=	8.08E-02	TO	1.35E-01
3	=	1.62E-01	TO	2.15E-01
4	=	2.42E-01	TO	2.96E-01
5	=	3.23E-01	TO	3.77E-01
6	=	4.04E-01	TO	4.58E-01
7	=	4.85E-01	TO	5.39E-01
8	=	5.66E-01	TO	6.19E-01
9	=	6.46E-01	TO	7.00E-01



LEGEND (IN PPM'S)

1	=	0.0	TO	3.52E-02
2	=	5.29E-02	TO	8.81E-02
3	=	1.06E-01	TO	1.41E-01
4	=	1.59E-01	TO	1.94E-01
5	=	2.11E-01	TO	2.47E-01
6	=	2.64E-01	TO	3.00E-01
7	=	3.17E-01	TO	3.52E-01
8	=	3.70E-01	TO	4.05E-01
9	=	4.23E-01	TO	4.58E-01

*NOTE: THIS IS A SCHEMATIC REPRESENTATION OF THE DATA RESULTS PRESENTED IN THE SURFACE PRINT FOR THIS SITE. BLANK SPACES INDICATE INTERMEDIATE VALUES BETWEEN ADJACENT INCREMENTS.

2216-1-A

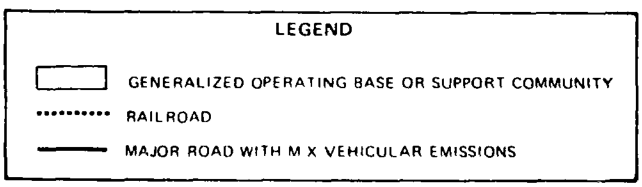
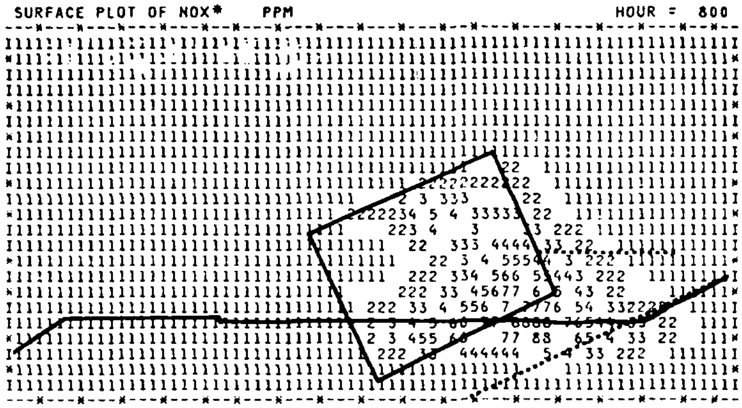


Figure 5.1.5-74. Predicted hourly CO concentrations at the Beryl OB site.

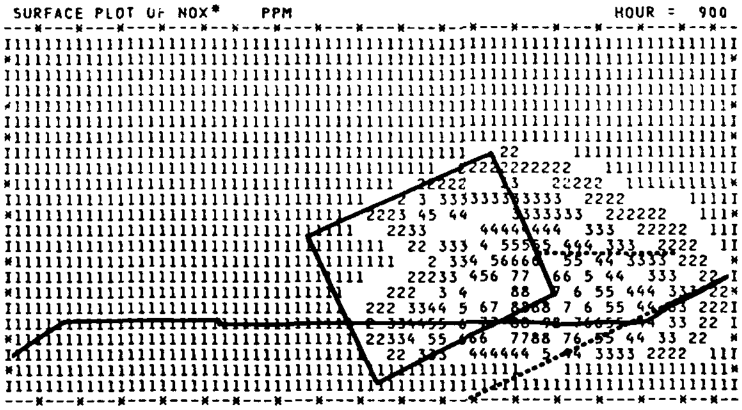
SURFACE PLOT OF NOX* PPM HOUR = 800



LEGEND (IN PPM'S)

1	=	0.0	TO	8.53E-03
2	=	1.28E-02	TO	2.13E-02
3	=	2.56E-02	TO	3.41E-02
4	=	3.84E-02	TO	4.69E-02
5	=	5.12E-02	TO	5.97E-02
6	=	6.39E-02	TO	7.25E-02
7	=	7.67E-02	TO	8.53E-02
8	=	8.95E-02	TO	9.80E-02
9	=	1.02E-01	TO	1.11E-01

SURFACE PLOT OF NOX* PPM HOUR = 900



LEGEND (IN PPM'S)

1	=	0.0	TO	1.37E-02
2	=	2.05E-02	TO	3.42E-02
3	=	4.10E-02	TO	5.47E-02
4	=	6.15E-02	TO	7.51E-02
5	=	8.20E-02	TO	9.56E-02
6	=	1.02E-01	TO	1.16E-01
7	=	1.23E-01	TO	1.37E-01
8	=	1.43E-01	TO	1.57E-01
9	=	1.64E-01	TO	1.78E-01

*NOTE: THIS IS A SCHEMATIC REPRESENTATION OF THE DATA RESULTS PRESENTED IN THE SURFACE PRINT FOR THIS SITE. BLANK SPACES INDICATE INTERMEDIATE VALUES BETWEEN ADJACENT INCREMENTS.

2217-1-A

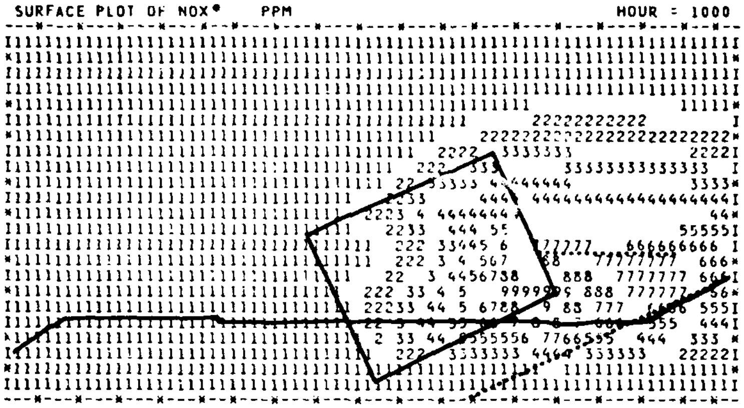
LEGEND

GENERALIZED OPERATING BASE OR SUPPORT COMMUNITY

RAILROAD

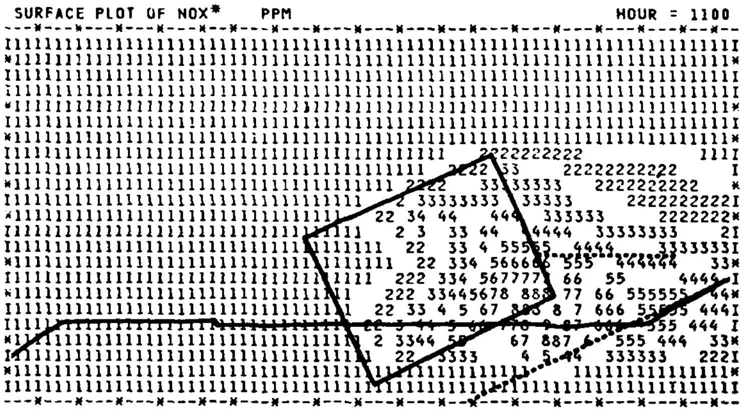
MAJOR ROAD WITH M X VEHICULAR EMISSIONS

Figure 5.1.5-75. Predicted hourly NO_x concentrations at the Beryl OB site.



LEGEND (IN PPM'S)

1	=	0.0	TO	3.75E-03
2	=	5.62E-03	TO	9.36E-03
3	=	1.12E-02	TO	1.50E-02
4	=	1.69E-02	TO	2.06E-02
5	=	2.25E-02	TO	2.62E-02
6	=	2.81E-02	TO	3.18E-02
7	=	3.37E-02	TO	3.75E-02
8	=	3.93E-02	TO	4.31E-02
9	=	4.49E-02	TO	4.87E-02



LEGEND (IN PPM'S)

1	=	0.0	TO	2.84E-03
2	=	4.26E-03	TO	7.10E-03
3	=	8.52E-03	TO	1.14E-02
4	=	1.28E-02	TO	1.56E-02
5	=	1.70E-02	TO	1.99E-02
6	=	2.13E-02	TO	2.41E-02
7	=	2.56E-02	TO	2.84E-02
8	=	2.98E-02	TO	3.27E-02
9	=	3.41E-02	TO	3.69E-02

*NOTE: THIS IS A SCHEMATIC REPRESENTATION OF THE DATA RESULTS PRESENTED IN THE SURFACE PRINT FOR THIS SITE. BLANK SPACES INDICATE INTERMEDIATE VALUES BETWEEN ADJACENT INCREMENTS.

2218-1-A

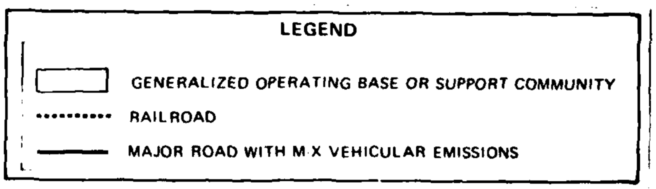
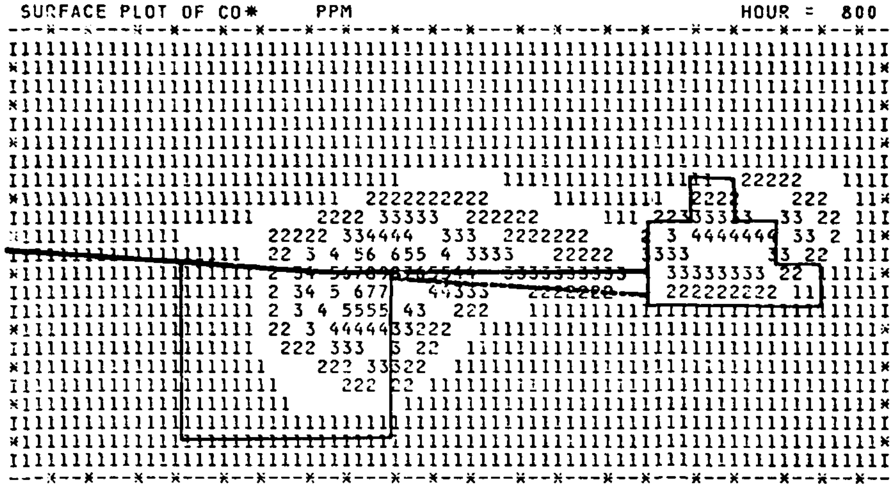


Figure 5.1.5-76. Predicted hourly NO_x concentrations at the Beryl OB site.

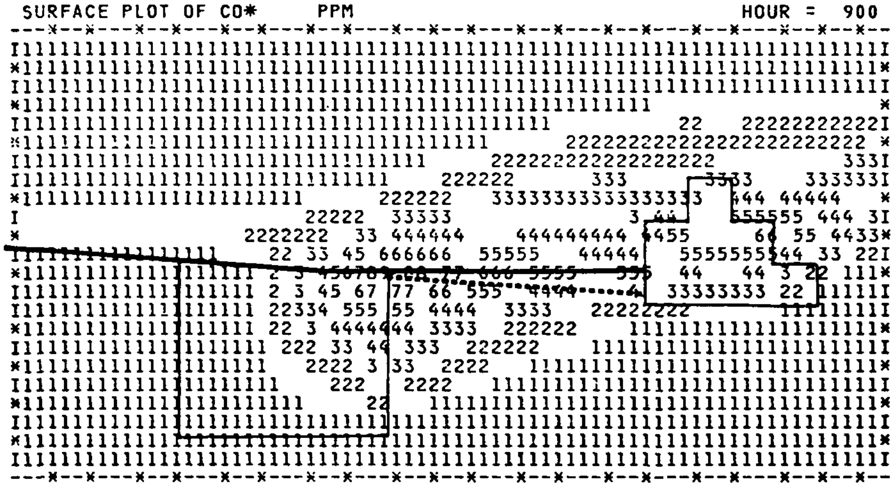
SURFACE PLOT OF CO* PPM HOUR = 800



LEGEND (IN PPM'S)

1	=	0.0	TO	9.95E-02
2	=	1.49E-01	TO	2.49E-01
3	=	2.99E-01	TO	3.98E-01
4	=	4.48E-01	TO	5.47E-01
5	=	5.97E-01	TO	6.97E-01
6	=	7.46E-01	TO	8.46E-01
7	=	8.96E-01	TO	9.95E-01
8	=	1.05E+00	TO	1.14E+00
9	=	1.19E+00	TO	1.29E+00

SURFACE PLOT OF CO* PPM HOUR = 900



LEGEND (IN PPM'S)

1	=	0.0	TO	9.69E-02
2	=	1.45E-01	TO	2.42E-01
3	=	2.91E-01	TO	3.88E-01
4	=	4.36E-01	TO	5.33E-01
5	=	5.82E-01	TO	6.78E-01
6	=	7.27E-01	TO	8.24E-01
7	=	8.72E-01	TO	9.69E-01
8	=	1.02E+00	TO	1.11E+00
9	=	1.16E+00	TO	1.26E+00

* NOTE: THIS IS A SCHEMATIC REPRESENTATION OF THE DATA RESULTS PRESENTED IN THE SURFACE PRINT FOR THIS SITE. BLANK SPACES INDICATE INTERMEDIATE VALUES BETWEEN ADJACENT INCREMENTS.

1994-A-1

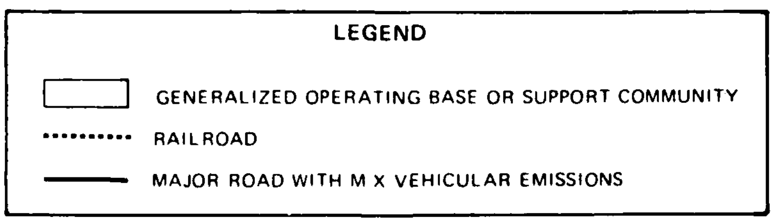
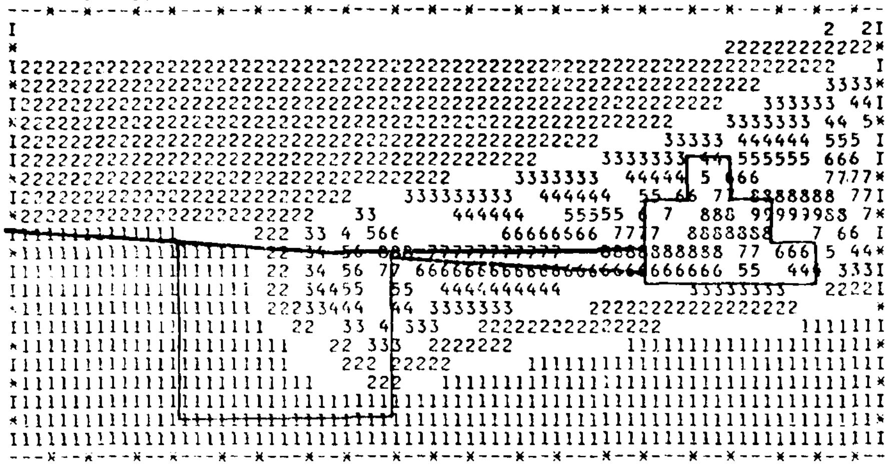


Figure 5.1.5-77. Predicted CO concentrations at the Clovis, New Mexico OB site and community.

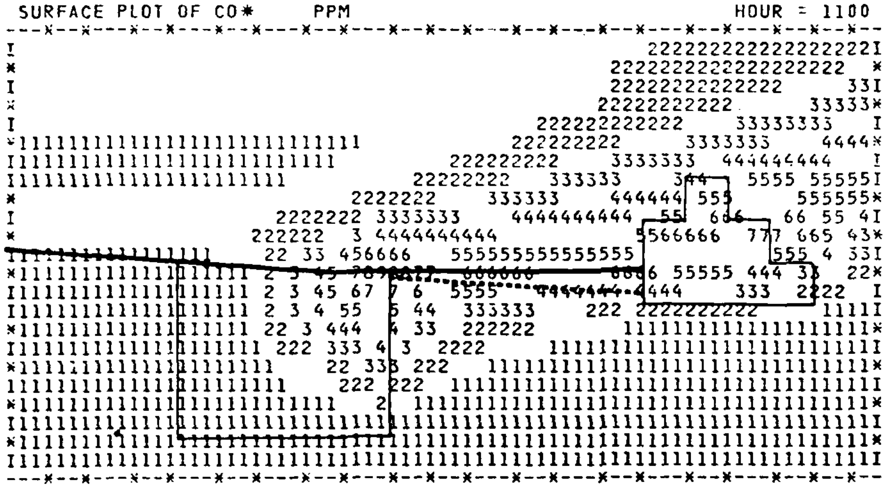
SURFACE PLOT OF CO* PPM HOUR = 1000



LEGEND (IN PPM'S)

1	=	0.0	TO	3.34E-02
2	=	5.00E-02	TO	8.34E-02
3	=	1.00E-01	TO	1.33E-01
4	=	1.50E-01	TO	1.83E-01
5	=	2.00E-01	TO	2.34E-01
6	=	2.50E-01	TO	2.84E-01
7	=	3.00E-01	TO	3.34E-01
8	=	3.50E-01	TO	3.84E-01
9	=	4.00E-01	TO	4.34E-01

SURFACE PLOT OF CO* PPM HOUR = 1100



LEGEND (IN PPM'S)

1	=	0.0	TO	2.62E-02
2	=	3.93E-02	TO	6.55E-02
3	=	7.86E-02	TO	1.05E-01
4	=	1.18E-01	TO	1.44E-01
5	=	1.57E-01	TO	1.83E-01
6	=	1.97E-01	TO	2.23E-01
7	=	2.36E-01	TO	2.62E-01
8	=	2.75E-01	TO	3.01E-01
9	=	3.15E-01	TO	3.41E-01

*NOTE: THIS IS A SCHEMATIC REPRESENTATION OF THE DATA RESULTS PRESENTED IN THE SURFACE PRINT FOR THIS SITE. BLANK SPACES INDICATE INTERMEDIATE VALUES BETWEEN ADJACENT INCREMENTS.

1995-A-1

LEGEND

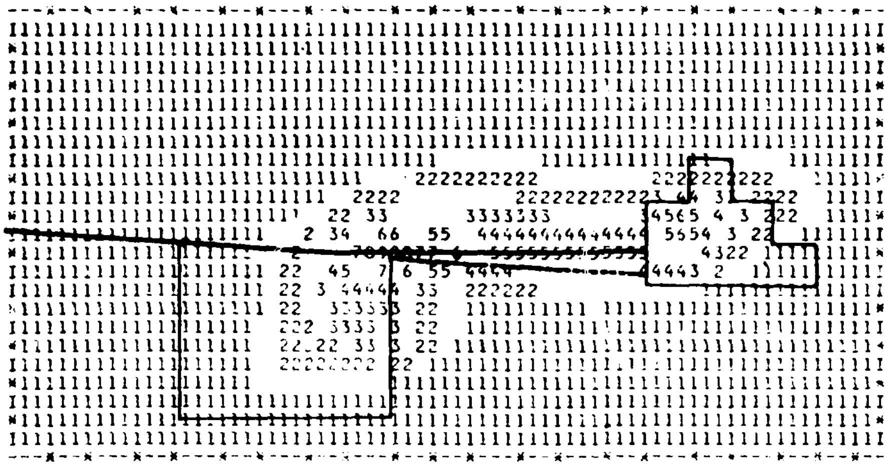
GENERALIZED OPERATING BASE OR SUPPORT COMMUNITY

RAILROAD

MAJOR ROAD WITH M X VEHICULAR EMISSIONS

Figure 5.1.5-78. Predicted CO concentrations at the Clovis, New Mexico OB site and community.

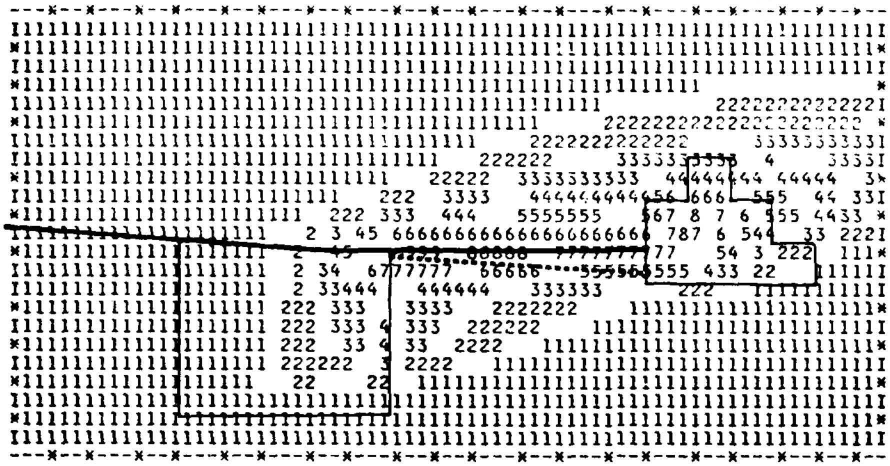
SURFACE PLOT OF NOX* PPM HOUR = 800



LEGEND (IN PPM'S)

1	=	0.0	TO	8.40E-03
2	=	1.26E-02	TO	2.10E-02
3	=	2.52E-02	TO	3.36E-02
4	=	3.78E-02	TO	4.62E-02
5	=	5.04E-02	TO	5.88E-02
6	=	6.30E-02	TO	7.14E-02
7	=	7.56E-02	TO	8.40E-02
8	=	3.82E-02	TO	9.66E-02
9	=	1.01E-01	TO	1.09E-01

SURFACE PLOT OF NOX* PPM HOUR = 900



LEGEND (IN PPM'S)

1	=	0.0	TO	8.16E-03
2	=	1.22E-02	TO	2.04E-02
3	=	2.45E-02	TO	3.26E-02
4	=	3.67E-02	TO	4.49E-02
5	=	4.89E-02	TO	5.71E-02
6	=	6.12E-02	TO	6.93E-02
7	=	7.34E-02	TO	8.16E-02
8	=	8.56E-02	TO	9.33E-02
9	=	9.79E-02	TO	1.06E-01

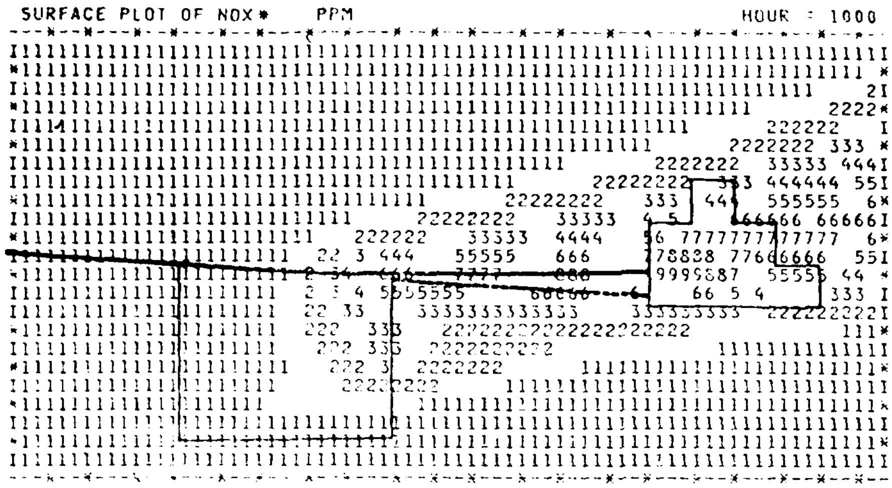
*NOTE: THIS IS A SCHEMATIC REPRESENTATION OF THE DATA RESULTS PRESENTED IN THE SURFACE PRINT FOR THIS SITE. BLANK SPACES INDICATE INTERMEDIATE VALUES BETWEEN ADJACENT INCREMENTS.

1992-A-1

LEGEND

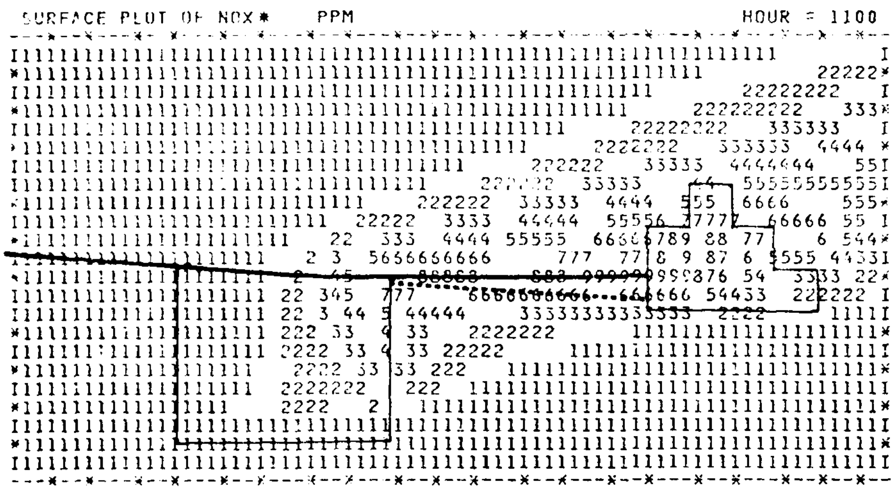
- GENERALIZED OPERATING BASE OR SUPPORT COMMUNITY
- RAILROAD
- MAJOR ROAD WITH M X VEHICULAR EMISSIONS

Figure 5.1.5-79. Predicted NO_x concentrations at the Clovis, New Mexico OB site and community.



LEGEND (IN PPM'S)

1	=	0.0	TO	3.65E-03
2	=	5.48E-03	TO	9.13E-03
3	=	1.10E-02	TO	1.46E-02
4	=	1.64E-02	TO	2.01E-02
5	=	2.19E-02	TO	2.56E-02
6	=	2.74E-02	TO	3.10E-02
7	=	3.29E-02	TO	3.65E-02
8	=	3.83E-02	TO	4.20E-02
9	=	4.38E-02	TO	4.75E-02



LEGEND (IN PPM'S)

1	=	0.0	TO	2.13E-03
2	=	3.19E-03	TO	5.32E-03
3	=	6.38E-03	TO	8.51E-03
4	=	9.57E-03	TO	1.17E-02
5	=	1.28E-02	TO	1.49E-02
6	=	1.60E-02	TO	1.81E-02
7	=	1.91E-02	TO	2.13E-02
8	=	2.23E-02	TO	2.45E-02
9	=	2.55E-02	TO	2.77E-02

*NOTE: THIS IS A SCHEMATIC REPRESENTATION OF THE DATA RESULTS PRESENTED IN THE SURFACE PRINT FOR THIS SITE. BLANK SPACES INDICATE INTERMEDIATE VALUES BETWEEN ADJACENT INCREMENTS.

1993-A-1

LEGEND

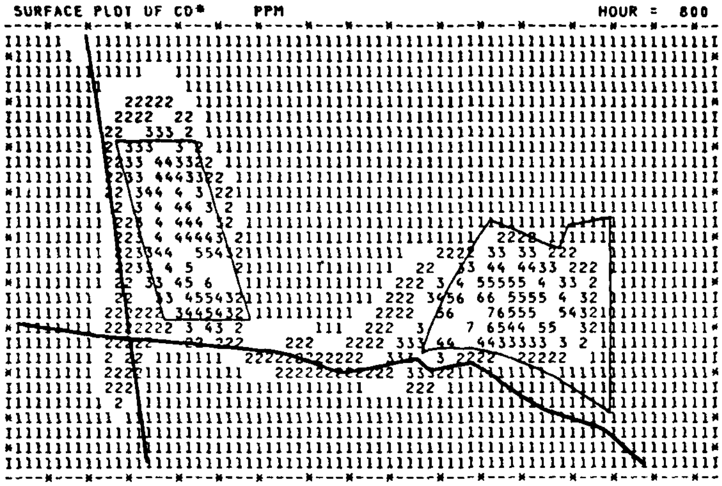
GENERALIZED OPERATING BASE OR SUPPORT COMMUNITY

RAIL ROAD

MAJOR ROAD WITH M-X VEHICULAR EMISSIONS

Figure 5.1.5-80. Predicted NO_x concentrations at the Clovis, New Mexico OB site and community.

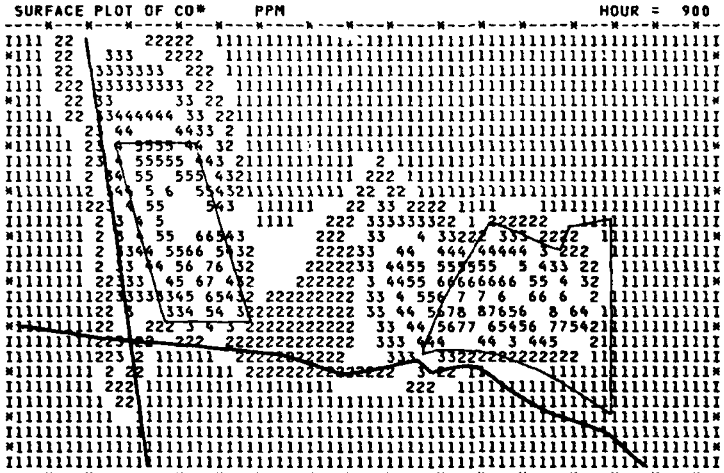
SURFACE PLOT OF CO* PPM HOUR = 800



LEGEND (IN PPM'S)

1	=	0.0	TO	1.16E-01
2	=	1.73E-01	TO	2.89E-01
3	=	3.47E-01	TO	4.62E-01
4	=	5.20E-01	TO	6.36E-01
5	=	6.94E-01	TO	8.09E-01
6	=	8.67E-01	TO	9.83E-01
7	=	1.04E+00	TO	1.16E+00
8	=	1.21E+00	TO	1.33E+00
9	=	1.39E+00	TO	1.50E+00

SURFACE PLOT OF CO* PPM HOUR = 900



LEGEND (IN PPM'S)

1	=	0.0	TO	1.20E-01
2	=	1.81E-01	TO	3.01E-01
3	=	3.61E-01	TO	4.81E-01
4	=	5.42E-01	TO	6.62E-01
5	=	7.22E-01	TO	8.43E-01
6	=	9.03E-01	TO	1.02E+00
7	=	1.08E+00	TO	1.20E+00
8	=	1.26E+00	TO	1.38E+00
9	=	1.44E+00	TO	1.56E+00

*NOTE: THIS IS A SCHEMATIC REPRESENTATION OF THE DATA RESULTS PRESENTED IN THE SURFACE PRINT FOR THIS SITE. BLANK SPACES INDICATE INTERMEDIATE VALUES BETWEEN ADJACENT INCREMENTS.

2213-1-A

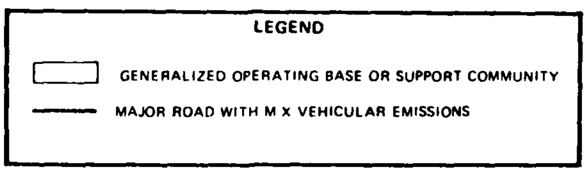
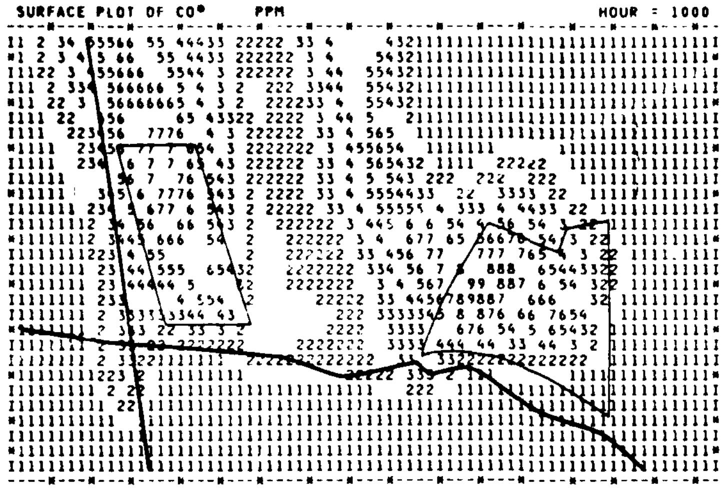


Figure 5.1.5-81. Predicted hourly CO concentrations at the Coyote Spring OB site.

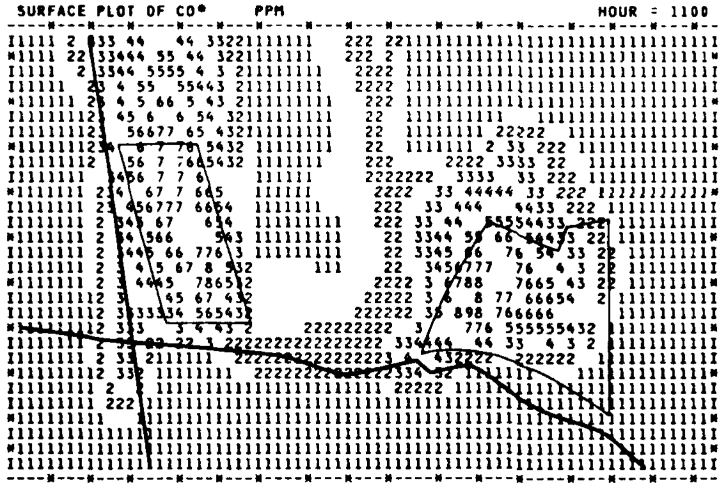
SURFACE PLOT OF CO* PPM HOUR = 1000



LEGEND (IN PPM'S)

1	=	0.0	TO	3.86E-02
2	=	5.79E-02	TO	9.65E-02
3	=	1.16E-01	TO	1.54E-01
4	=	1.74E-01	TO	2.12E-01
5	=	2.32E-01	TO	2.70E-01
6	=	2.89E-01	TO	3.28E-01
7	=	3.47E-01	TO	3.86E-01
8	=	4.05E-01	TO	4.44E-01
9	=	4.63E-01	TO	5.02E-01

SURFACE PLOT OF CO* PPM HOUR = 1100



LEGEND (IN PPM'S)

1	=	0.0	TO	2.27E-02
2	=	3.41E-02	TO	5.68E-02
3	=	6.81E-02	TO	9.08E-02
4	=	1.02E-01	TO	1.25E-01
5	=	1.36E-01	TO	1.59E-01
6	=	1.70E-01	TO	1.93E-01
7	=	2.04E-01	TO	2.27E-01
8	=	2.38E-01	TO	2.61E-01
9	=	2.72E-01	TO	2.95E-01

*NOTE: THIS IS A SCHEMATIC REPRESENTATION OF THE DATA RESULTS PRESENTED IN THE SURFACE PRINT FOR THIS SITE. BLANK SPACES INDICATE INTERMEDIATE VALUES BETWEEN ADJACENT INCREMENTS.

2214.1.A

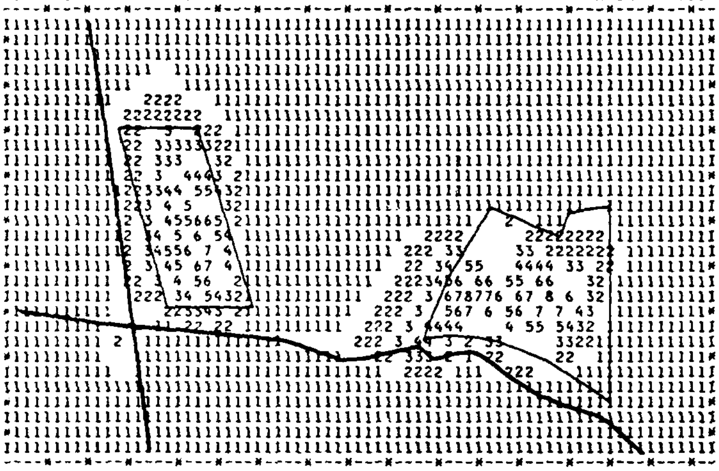
LEGEND

GENERALIZED OPERATING BASE OR SUPPORT COMMUNITY

MAJOR ROAD WITH M X VEHICULAR EMISSIONS

Figure 5.1.5-82. Predicted hourly CO concentrations at the Coyote Spring OB site.

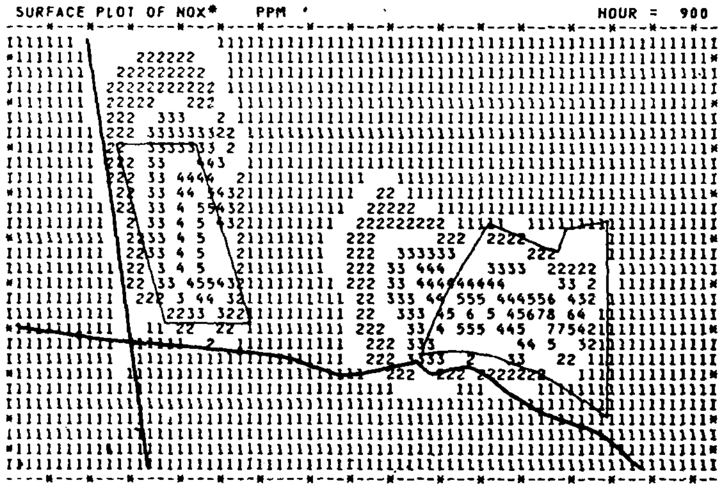
SURFACE PLOT OF NOX* PPM HOUR = 800



LEGEND (IN PPM'S)

1	=	0.0	TO	9.23E-03
2	=	1.38E-02	TO	2.31E-02
3	=	2.77E-02	TO	3.69E-02
4	=	4.15E-02	TO	5.08E-02
5	=	5.54E-02	TO	6.46E-02
6	=	6.92E-02	TO	7.85E-02
7	=	8.31E-02	TO	9.23E-02
8	=	9.69E-02	TO	1.06E-01
9	=	1.11E-01	TO	1.20E-01

SURFACE PLOT OF NOX* PPM HOUR = 900



LEGEND (IN PPM'S)

1	=	0.0	TO	1.54E-02
2	=	2.31E-02	TO	3.84E-02
3	=	4.61E-02	TO	6.15E-02
4	=	6.92E-02	TO	8.45E-02
5	=	9.22E-02	TO	1.08E-01
6	=	1.15E-01	TO	1.31E-01
7	=	1.38E-01	TO	1.54E-01
8	=	1.61E-01	TO	1.77E-01
9	=	1.84E-01	TO	2.00E-01

*NOTE THIS IS A SCHEMATIC REPRESENTATION OF THE DATA RESULTS PRESENTED IN THE SURFACE PRINT FOR THIS SITE. BLANK SPACES INDICATE INTERMEDIATE VALUES BETWEEN ADJACENT INCREMENTS.

2219 1 A

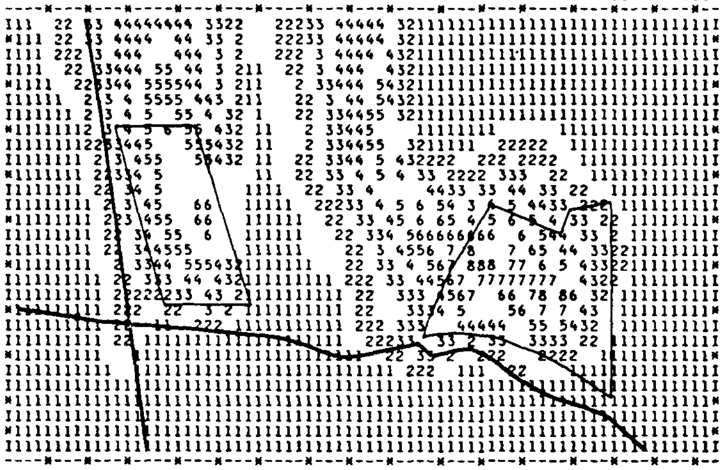
LEGEND

GENERALIZED OPERATING BASE OR SUPPORT COMMUNITY

MAJOR ROAD WITH M X VEHICULAR EMISSIONS

Figure 5.1.5-83. Predicted hourly NO_x concentrations at the Coyote Spring OB site.

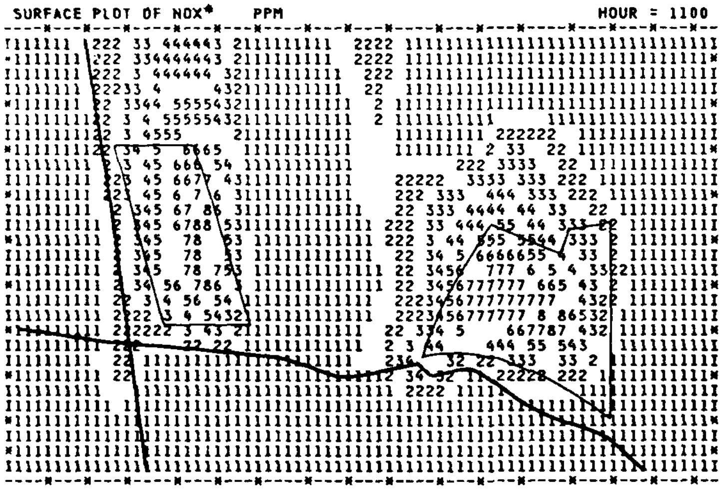
SURFACE PLOT OF NOX* PPM HOUR = 1000



LEGEND (IN PPM'S)

1	=	0.0	TO	3.81E-03
2	=	5.71E-03	TO	9.52E-03
3	=	1.14E-02	TO	1.52E-02
4	=	1.71E-02	TO	2.09E-02
5	=	2.28E-02	TO	2.67E-02
6	=	2.86E-02	TO	3.24E-02
7	=	3.43E-02	TO	3.81E-02
8	=	4.00E-02	TO	4.38E-02
9	=	4.57E-02	TO	4.95E-02

SURFACE PLOT OF NOX* PPM HOUR = 1100



LEGEND (IN PPM'S)

1	=	0.0	TO	2.09E-03
2	=	3.13E-03	TO	5.22E-03
3	=	6.26E-03	TO	8.35E-03
4	=	9.40E-03	TO	1.15E-02
5	=	1.25E-02	TO	1.46E-02
6	=	1.57E-02	TO	1.77E-02
7	=	1.88E-02	TO	2.09E-02
8	=	2.19E-02	TO	2.40E-02
9	=	2.51E-02	TO	2.71E-02

*NOTE: THIS IS A SCHEMATIC REPRESENTATION OF THE DATA RESULTS PRESENTED IN THE SURFACE PRINT FOR THIS SITE. BLANK SPACES INDICATE INTERMEDIATE VALUES BETWEEN ADJACENT INCREMENTS.

2220-1-A

LEGEND

- GENERALIZED OPERATING BASE OR SUPPORT COMMUNITY
- MAJOR ROAD WITH M X VEHICULAR EMISSIONS

Figure 5.1.5-84. Predicted hourly NO_x concentrations at the Coyote Spring OB site.

Assuming that all emissions occur during an eight-hour construction day, an emission factor is calculated as follows:

$$\frac{104\ \text{kg}}{\text{mile-8 hr}} \times \frac{1000\ \text{gram}}{1\ \text{kg}} \times \frac{1\ \text{mile}}{1{,}609\ \text{meters}} \times \frac{1\ \text{hour}}{3{,}600\ \text{second}} = \frac{.0023\ \text{gram}}{\text{second-meter}}$$

This emission rate was input into an EPA-approved line source dispersion model, HIWAY, for a four kilometer section of cluster roadway. Low wind speed and E class Pasquill stability were used as conditions to assure conservative estimates. The results in Table 5.2-1 indicated that at a distance of 50 meters to the line source, the NO_x concentration had dropped to a level of 519 ug/m^3. This is an hourly measure which cannot be directly compared to the federal annual standard of 100 ug/m^3. However, the actual annual average would be only a fraction of the federal standard because the HIWAY output value of 519 ug/m^3 represents a conservative condition case which occurs at most only on construction days and only during construction hours.

Emission rates calculated for the other gaseous pollutants of concern were even lower than that of NO_x. The rate of emission of carbon monoxide was the next highest value at 3,400 lb/day (1,542 kg/day), less than half the rate of NO_x release. Performing a similar analysis as above with the HIWAY model would provide CO concentration levels below those of the NO_x case. The CO 1-hour federal standard of 40 mg/m^3 is much higher than the NO_x concentration result of 519 ug/m^3 and therefore no significant air quality impact would be expected from CO release. Likewise, the other gaseous pollutants are emitted at rates below either the NO_x or CO levels.

OB OPERATIONS

The effects of traffic emissions associated with OB operation were estimated through the use of the EPA HIWAY line source model. Emission factors for various vehicle volumes were determined in accordance with "EPA Mobile Source Emission Factors" (1978). As specific vehicle mix and speed data were not available, the national average mix and a speed of 45 mph were assumed. Table 5.2-2 shows emission factors for CO, HC and NO_x at selected vehicle volumes. Meteorological conditions were chosen which would insure conservative results: wind speed of 1 meter/sec; stability Class F (moderately stable atmosphere); 25 meters mixing height. Figure 5.2-1 depicts concentrations occurring when the wind direction is 45 degrees with respect to the roadway. A direction of 45 degrees was chosen as it has been determined that HIWAY under-predicts for crosswind cases and over-predicts for parallel wind cases.*

Of the three pollutants modeled, CO is of most concern on a local basis. The results presented in Figure 5.2-1 indicate that for vehicle volumes of up to 10,000 vehicles per hour on a single roadway no applicable standard would be violated at a distance of 50 meters. Table 5.2-3 presents the vehicle volumes and resultant concentrations of pollutants associated with OB traffic.

* Noll, K.E., Miller, T.L., and Claggett, M. "A Comparison of Highway Line Source Dispersion Models," Atmospheric Environment, Vol. 12, 1978.

Table 5.2-1. NO_x concentrations from construction equipment emissions.

```
  HIWAY VERSION: 78010
ENDPOINTS OF THE LINE SOURCE
   0.000,    -5.000 AND     0.000,     5.000
EMISSION HEIGHT IS    1.000 METERS
EMISSION RATE (GRAMS/SECOND*METER) OF    1 LANE(S)
    230E-02
WIDTH OF AT-GRADE HIGHWAY IS       20.0 M
WIDTH OF CENTER STRIP IS       0.0 M
WIND DIRECTION IS    270   DEGREES
WIND SPEED IS    1.0 METERS/SEC
STABILITY CLASS IS    6
HEIGHT OF LIMITING LID IS     25.0 METERS
THE SCALE OF THE COORDINATE AXES IS      1.0000 KM/USER UNIT.

  RECEPTOR LOCATION        HEIGHT      CONCENTRATION
      X          Y           Z(M)      UGM/METER**3        PPM *
    .0250      0.0000      2.0000          553.            .482
    .0500      0.0000      2.0000          519.            .451
    1000       0.0000      2.0000          443.            .385
    .5000      0.0000      2.0000          195.            .169
   1.0000      0.0000      2.0000          125.            .109
*  PPM CONCENTRATIONS CORRECT FOR CARBON MONOXIDE ONLY.
```

Table 5.2-2. Emission factors for CO, HC and NO_x at selected vehicle volumes.

VEHICLES/HOUR	CO	HC	NO_x
100	.00046	.00007	.00007
500	.0023	.00035	.00038
1,000	.0046	.00071	.00076
1,500	.0690	.00106	.00114
2,500	.0110	.00177	.00190
5,000	.023	.00354	.00380
7,500	.034	.00531	.00570

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[1]Based on data from Table F-21, "Mobile Source Emission Factors," EPA, 1978.

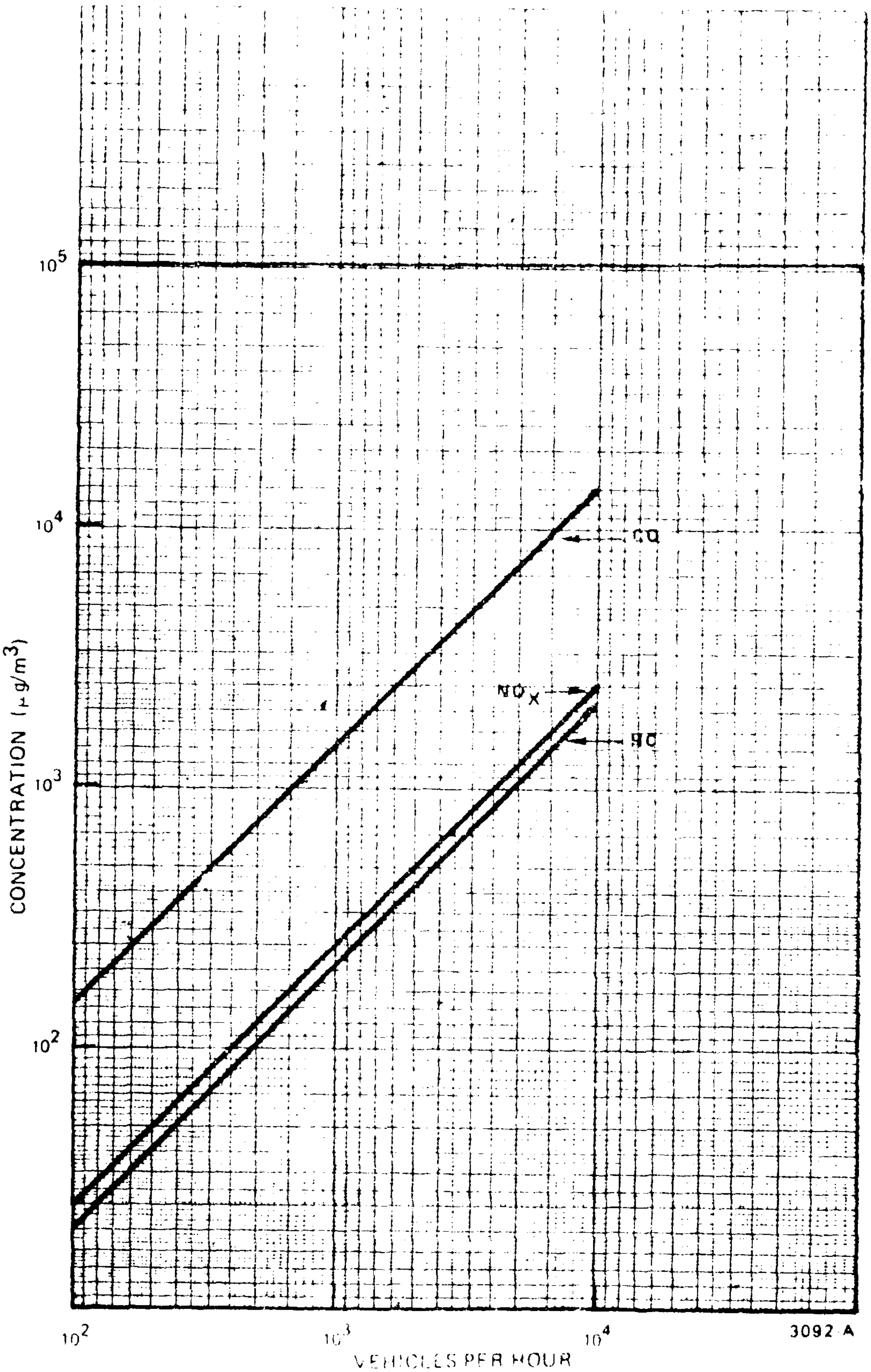

Figure 5.2-1. Pollutant concentration vs. [illegible] meters from [illegible] way.

Table 5.2-3. Traffic related concentrations (1 hour averages).

OPERATING BASE	PEAK HOUR TRAFFIC (VEHICLES/HOUR)	CONCENTRATIONS ($\mu g/m^3$)		
		CO	HC	NO_x
Coyote Spring, NV				
Baseline	85	<100	<20	<25
Baseline + M-X	2,125	3,000	400	500
Beryl, UT				
Baseline	69	<100	<20	<25
Baseline + M-X	1,854	2,700	370	460
Ely, NV				
Baseline	273	390	55	65
Baseline + M-X	1,643	2,300	320	380
Delta, UT				
Baseline	80	<100	<20	<25
Baseline + M-X	1,910	2,800	400	480
Clovis, NM				
Baseline	1,144	1,600	220	270
Baseline + M-X	3,244	4,400	640	740
Dalhart, TX				
Baseline	593	820	120	150
Baseline + M-X	2,198	3,100	420	520

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5.3 PAL

PARTICULATE POLLUTANT IMPACTS

The PAL model was used to analyze potential local impacts of fugitive dust emissions from point, area, and line sources associated with construction activities. Very conservative results were assured due to the dispersion assumptions utilized by the model: 1) no settling of dust occurs, and 2) there is complete reflection of dust particles at the terrain surface. These assumptions of no deposition and complete reflectivity effectively increase the predicted concentration levels, which is consistent with a "worst-case" type of analysis. It is not anticipated that the levels of dust predicted by the model will actually exist. To put the modeling results in perspective, the quantities of fugitive dust from M-X construction activities are primarily generated by heavy-duty earth-moving equipment similar to that used in highway construction programs. Thus, the quantities of dust raised are characteristic of that of other large construction efforts. Close to the construction activities, a dust problem would be expected and this is confirmed by initial modeling.

Tables 5.3-1 and 5.3-2, and Figure 5.3-1 present the results of the PAL model for selected emission sources associated with the construction activity in the deployment area and at the operating bases. Due to the limitations of modeling fugitive dust with PAL, as discussed above, the results should be viewed as indicating that a severe fugitive dust problem will exist near the construction activity, but not necessarily at the reported concentrations. Prerequisites for a more precise analysis are: 1) a more sophisticated fugitive dust dispersion and transport algorithm, 2) site-specific meteorological data, 3) detailed construction scheduling information, and 4) a breakdown of mitigation measures which will be applied. Research into state-of-the-art fugitive dust modeling techniques is in progress, and potential improvements to existing models are being evaluated.

The Army Corps of Engineers is the construction agent for M-X and will assure that the best available control technology and commonly accepted engineering procedures will be used to control construction dust and mitigate its effects. In addition, localized air quality effects due to construction dust are temporary; as roads and shelters are constructed, and the construction activity moves to the next construction locale.

During the operational phase of M-X, the only M-X-induced fugitive dust emissions expected in individual deployment areas will be due to wind erosion and vehicular traffic necessary for system security and maintenance. Analyses of particulate concentrations during operations are not possible until specific data on maintenance and security traffic are available.

GASEOUS POLLUTANT IMPACTS

Construction-Related Generator Emissions Impacts

Preliminary emissions estimates presented in Tables 4.1.2.3-2 through 4.1.2.3-7 indicate high NO_x emissions may result from the diesel generators used to provide power for the stationary sources that produce and process construction materials. Data is insufficient to satisfactorily model air quality impacts from generator emissions. Unknown parameters include the location, number, and type of generators to be used, as well as data on the emission control equipment proposed.

Table 5.3-1. Localized particulate conditions due to construction activity as predicted by the PAL model: Nevada/Utah.

METEOROLOGICAL CONDITIONS				SOURCE TYPE	CONCENTRATIONS (ug/m^3) DOWNWIND			
					0.5 KM		4.0 KM	
OBSERVATION	MIXING HEIGHT (METERS)	WINDSPEED (ms^{-1})	STABILITY CLASS		NON-MITIGATED EMISSIONS	MITIGATED EMISSIONS	NON-MITIGATED EMISSIONS	MITIGATED EMISSIONS
Worst 1-Day Observation[a]	116	3.3	E	Shelter area[b] (7 acres)	2.4×10^3	1.2×10^3	2.5×10^2	1.2×10^2
				2 km segment of[c] cluster road	3.3×10^3	9.4×10^2	8.9×10^2	2.5×10^2
				2 km segment of DTN road[d]	1.0×10^4	2.9×10^3	2.7×10^3	7.8×10^2
Worst 5-day Observation[a]	277	2.3	E	Shelter area[b] (7 acres)	3.4×10^3	1.7×10^3	3.5×10^2	1.8×10^2
				2 km segment of[c] cluster road	4.8×10^3	1.4×10^3	1.3×10^3	3.6×10^2
				2 km segment of DTN road[d]	1.5×10^4	4.1×10^3	3.9×10^3	1.1×10^3

2992

[a]From observations recorded at Ely, NV, from "Meteorological Episodes of Slowest Dilution in the Contiguous U.S.", G. Holzworth, Feb. 1974.

[b]High level construction activity factor of 1.8 ton/acre was used to calculate emission rate for non-mitigated case. Mitigation measures (oiling, watering, etc.) assumed to reduce emission rate by 50 percent for mitigated case. 45° wind direction with respect to road assumed.

[c]Road segment handles traffic to and from active cluster road construction area and the batch plant. Mitigation case assumes 50 percent reduction in emission rate due to oiling and watering, plus lower silt content, resulting in a net emission reduction of 72 percent. 45° wind direction, with respect to road.

[d]Road segment handles traffic to and from the cluster road construction area, shelter construction area, and batch plant. Other conditions same as Footnote [c].

Table 5.3-2. Localized particulate concentrations due to construction activity as predicted by the PAL model: Texas/New Mexico.

METEOROLOGICAL CONDITIONS				SOURCE TYPE	CONCENTRATIONS ($\mu g/m^3$) DOWNWIND			
					0.5 KM		4.0 KM	
OBSERVATION	MIXING HEIGHT (METERS)	WIND SPEED (MS-1)	STABILITY CLASS		NON-MITIGATED EMISSIONS	MITIGATED EMISSIONS	NON-MITIGATED EMISSIONS	MITIGATED EMISSIONS
Worst 1-Day Observation[a]	100	3.6	E	Shelter Area[b] (7 Acres)	2.2×10^3	1.1×10^3	1.2×10^2	1.1×10^2
				2 KM Segment of Cluster Road[c]	3.0×10^3	8.6×10^2	8.2×10^2	2.3×10^2
				2 KM Segment of DTN Road[d]	9.3×10^3	2.6×10^3	2.5×10^3	7.1×10^2
Worst 5-Day Observation[a]	539	5.1	E	Shelter Area[b] (7 Acres)	1.6×10^3	7.8×10^2	1.6×10^2	7.9×10^1
				2 KM Segment of Cluster Road[c]	2.1×10^3	6.1×10^2	5.8×10^2	1.6×10^2
				2 KM Segment of DTN Road[d]	6.6×10^3	1.9×10^3	1.8×10^3	5.0×10^2

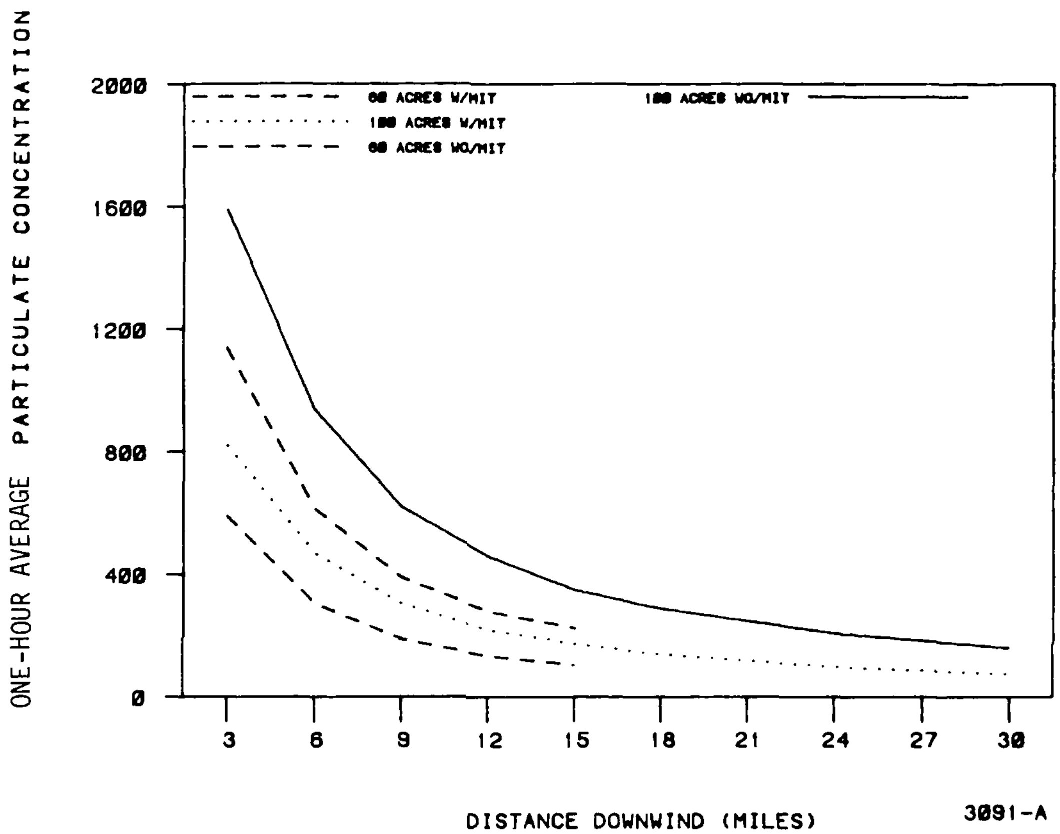
2965

[a]From observations recorded at Amarillo, TX, from Meteorological Episodes of Slowest Dilution in the Contiguous United States, G. Holzworth, Feb. 1974.

[b]High level construction activity factor of 1.8 ton acre was used to calculate emission rate for non-mitigated case. Mitigation measures (oiling, watering, etc.) assumed to reduce emission rate by 50 percent for mitigated case. 45° wind direction with respect to road assumed.

[c]Road segment handles traffic to and from active cluster road construction area and the batch plant emission factor of 0.007 ton/vehicle-mile used to calculate worst case emission rates. Mitigation case assumes 50 percent reduction in emission rate due to oiling and watering, plus lower silt content, resulting in a net emission reduction of 72 percent. 45° wind direction with respect to road assumed.

[d]Road segment handles traffic to and from the cluster road construction area, shelter construction area, and batch plant. Other conditions same as footnote c.



NOTE:

1) Concentrations are 1-hour averages, reported in micrograms per cubic meter (ug/m^3)

2) Meteorological conditions: wind speed = 5 m/s, stable atmosphere, 500 meter mixing height

3) Concentrations reported for 60 and 100 acres of construction activity.

Figure 5.3-1. Potential fugitive dust impacts due to OB construction.

Preliminary modeling was conducted to determine if an NO_x air quality impact might occur. Assumptions used include:

- three generators operated within a 30-acre facility
- no control equipment
- emissions rates for each generator was 3.0 gm/sec
- wind speed equals 3.0 meters/sec, Pasquill stability Class E, and a mixing layer height of 60 meters.

The maximum predicted hourly concentration using the above assumptions was 836 ug/m^3. For comparison, the NO_x annual NAAQS is 100 ug/m^3. Insufficient meteorological and emissions data was available to predict annual concentrations for direct comparison with the annual NO_x air quality standard.

5.4 ISC (INDUSTRIAL SOURCE COMPLEX) MODEL

Because of certain model limitations inherent in the EPA-approved Gaussian models, the IMPACT model was used to predict particulate concentrations in the construction areas. The Industrial Source Complex (ISC) model is an EPA-approved air pollutant dispersion model which was available only recently. The ISC model was not available soon enough to be used and have results presented in the M-X system DEIS. However, we have obtained the model, tested its capability, and applied the model to the operating base construction situation for comparison with the PAL model runs which were included in the DEIS. The results of these runs are presented here.

The ISC model is superior to the PAL model for predicting particulate concentrations downwind of fugitive dust emissions from construction activity for several reasons. The ISC model was designed to combine and improve various algorithms from existing accepted air quality models in order to assess air pollutant concentrations and dry deposition from a variety of sources associated with an industrial source complex. Most importantly the ISC model accounts for gravitational settling and dry deposition. For special ISC model options, the user can input site- or source-specific data. If more reliable data is not available for the modeled condition, the model will use preselected default values obtained from previous studies.

Particle size distribution, deposition velocity, and reflection data are not available for construction activity emissions. Values used in the model were obtained from ore pile emissions data given in the model documentation volume (Industrial Source Complex (ISC) Dispersion Model User's Guide, Volume I, Dec. 1979), and are presented in Table 5.4-1.

Worst-case meteorological data at weather stations most representative of conditions at the operating bases are given in Table 5.4-2. Worst one-day and five-day conditions observed for pollutant dispersion during the period of record (1960-64) are presented. The worst one-day observations, representing the conditions which would produce the highest pollutant concentrations, were selected to use in the ISC model.

Table 5.4-1. Particle-size distribution, gravitational setting velocities and surface reflection coefficients for particulate emissions used in the ISC modeling of fugitive dust from OB construction activity.

PARTICLE SIZE CATEGORY (μm)	MASS MEAN DIAMETER (μm)	MASS FRACTION (PERCENT)	SETTLING VELOCITY (m/sec)	REFLECTION COEFFICIENT**
0 - 10	6.30	0.10	0.001	1.00
10 - 20	15.54	0.40	0.007	0.82
20 - 30	25.33	0.23	0.019	0.72
30 - 40	35.24	0.12	0.037	0.65
40 - 50	45.18	0.06	0.061	0.59
50 - 65	17.82	0.04	0.099*	0.50

4165

** 1.00 indicates total reflection of particles at the surface.

* Source: Values presented here and used in model calculations represent one pile and conveyor belt particulate emissions data as described in the "Industrial Source Complex Dispersion Model (ISC) User's Guide, Volume I, 1979."

Table 5.4-2. Weather station data used in meteorological input conditions for ISC modeling.

WEATHER STATION	APPLICABLE OB SITE	OBSERVATION[a]	MIXING HEIGHT (meters)	WINDSPEED (m/sec)	STABILITY CLASS
Amarillo, TX.	Dalhart, TX	Worst 1-Day Observation	100	3.6	E
		Worst 5-Day Observation	539	5.1	E
Ely, NV	Ely, NV	Worst 1-Day Observation	116	3.3	E
		Worst 5-Day Observation	277	2.3	E
Albuquerque, NM	Clovis, NM	Worst 1-Day Observation	273	1.4	F
		[illegible]rst 5-Day [illegible]vation	421	1.9	E
Las Vegas, NV	Coyote Spring, NV	Worst 1-Day Observation	102	1.9	E
		Worst 5-Day Observation	252	2.0	F
Salt Lake City, UT	Delta, UT	Worst 1-Day Observation	163	0.5	F
		Worst 5-Day Observation	209	2.5	E

4166

[a]From observations recorded during 1960-64, as used in "Meteorological Episodes of Slowest Dilution in the Contiguous U.S.", G. Holzworth, February 1974.

The modeling results are presented in Figures 5.4-1 through 5.4-4 for all four options; 60 and 100 acres with mitigated or unmitigated emission rates. The emissions included only represent those emissions for heavy construction activity (AP-42*) and do not include other related emissions such as materials production, processing, or excavation, or wind erosion since adequate data is not available. Further, definition of the OB construction schedule is inadequate at the time of publication to define construction activity rates more precisely than the 60- to 100-acre estimates given here.

The results presented here are far more realistic than those presented earlier for the PAL model because of the refinements in pollutant predictions provided by the incorporation of pollutant deposition and gravitational settling.

Particulate concentations at 5 km from the construction activity range from a high at Beryl, Utah, of nearly 3,000 ug/m^3 (with 100 acres of unmitigated construction activity) to a low at approximately 340 ug/m^3 at Dalhart, Texas. These concentrations are hourly averages predicted to occur only during the worst daily weather observations recorded during the time period of data. Pollutant differences between sites only reflect the effect of site variation in wind speed and direction, mixing height, and stability class on pollutant dispersion. Site variations in soil silt content and humidity will affect emission rates and resulting concentrations. These factors could not be taken into account in the emission calculations because the construction activity emission factor does not have correction factors.

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* The factor used here is 1.8 tons of particulates per acre of construction per month of activity rather than the 1.2 tons of particulates suggested since the conditions that applied to the given rate (level of activity and climate) were not conservative enough.

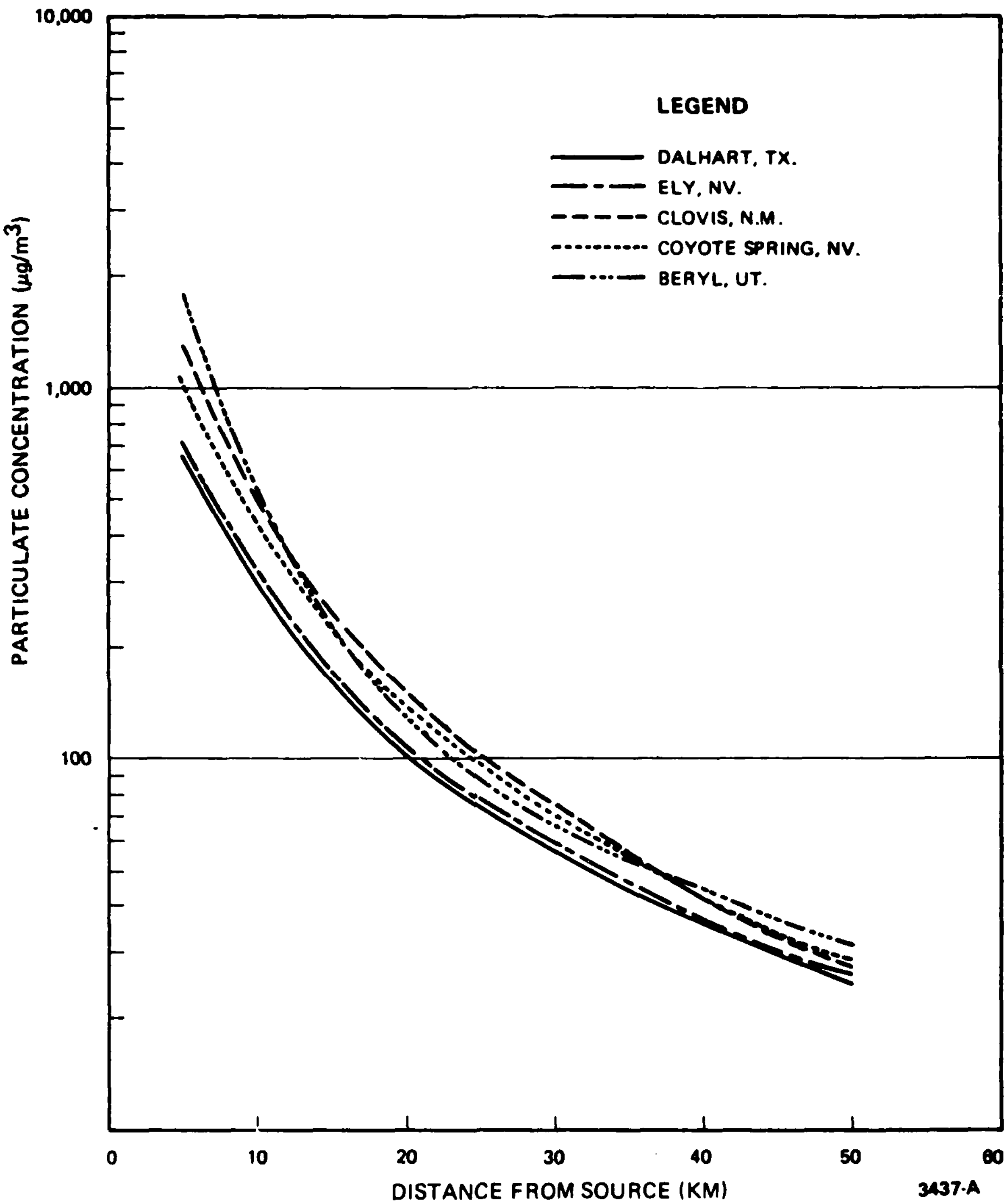


Figure 5.4-1. Predicted hourly particulates concentrations using the ISC model: 60 acres of construction activity with unmitigated emissions.

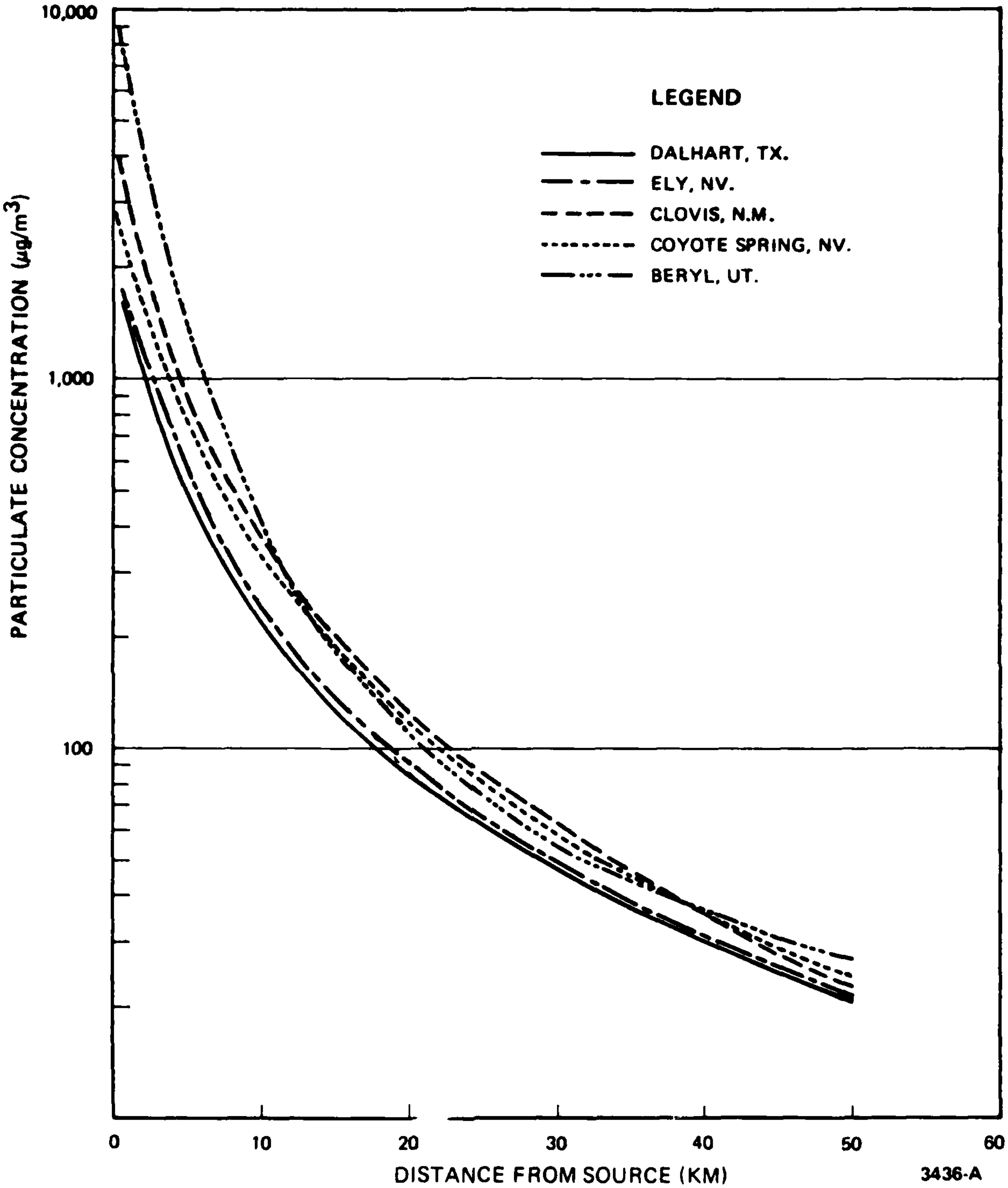


Figure 5.4-2. Predicted hourly particulate concentrations using the ISC model: 100 acres of construction activity with mitigated emissions.

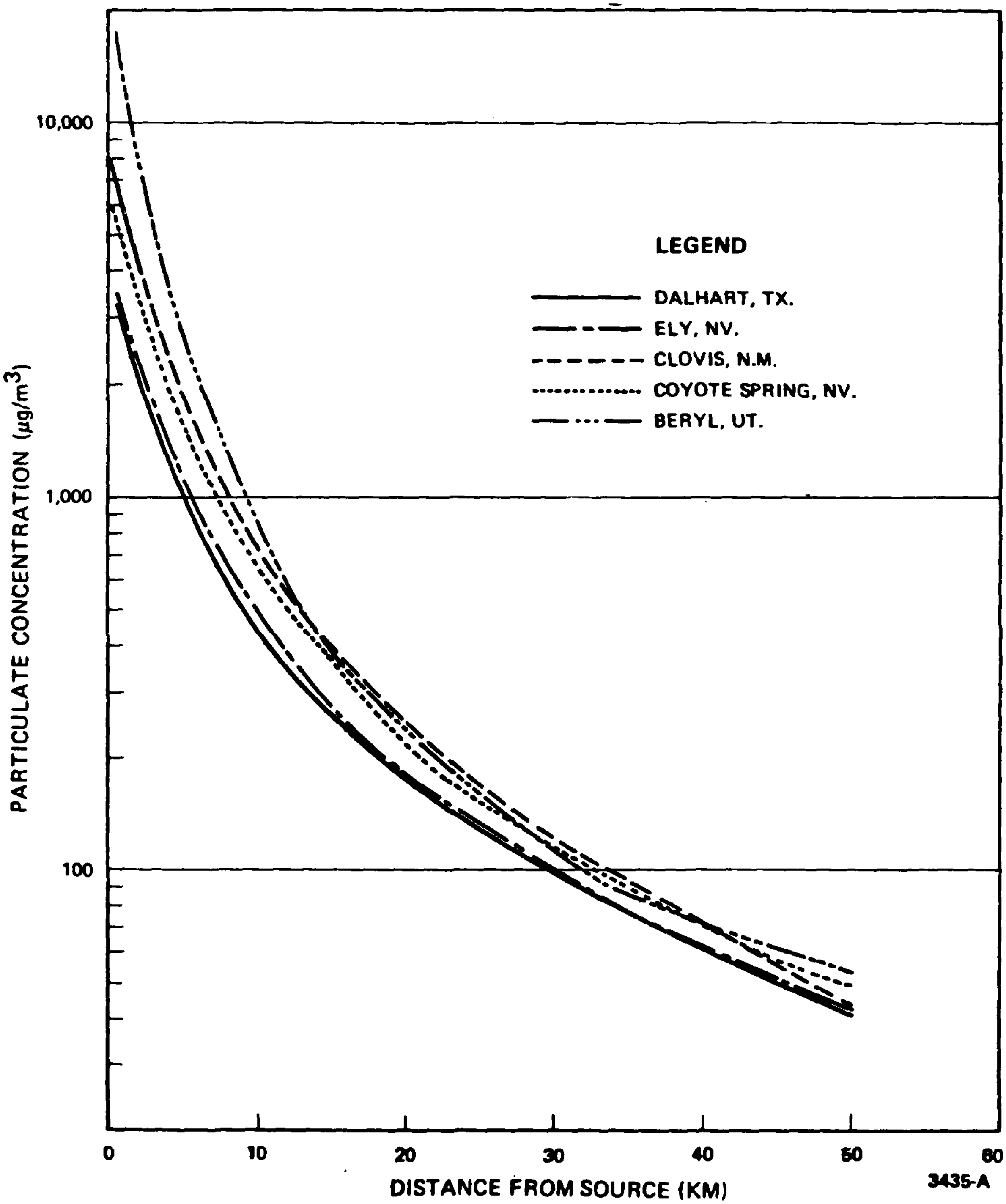


Figure 5.4-3. Predicted hourly particulate concentrations using the ISC model: 100 acres of construction activity with unmitigated emissions.

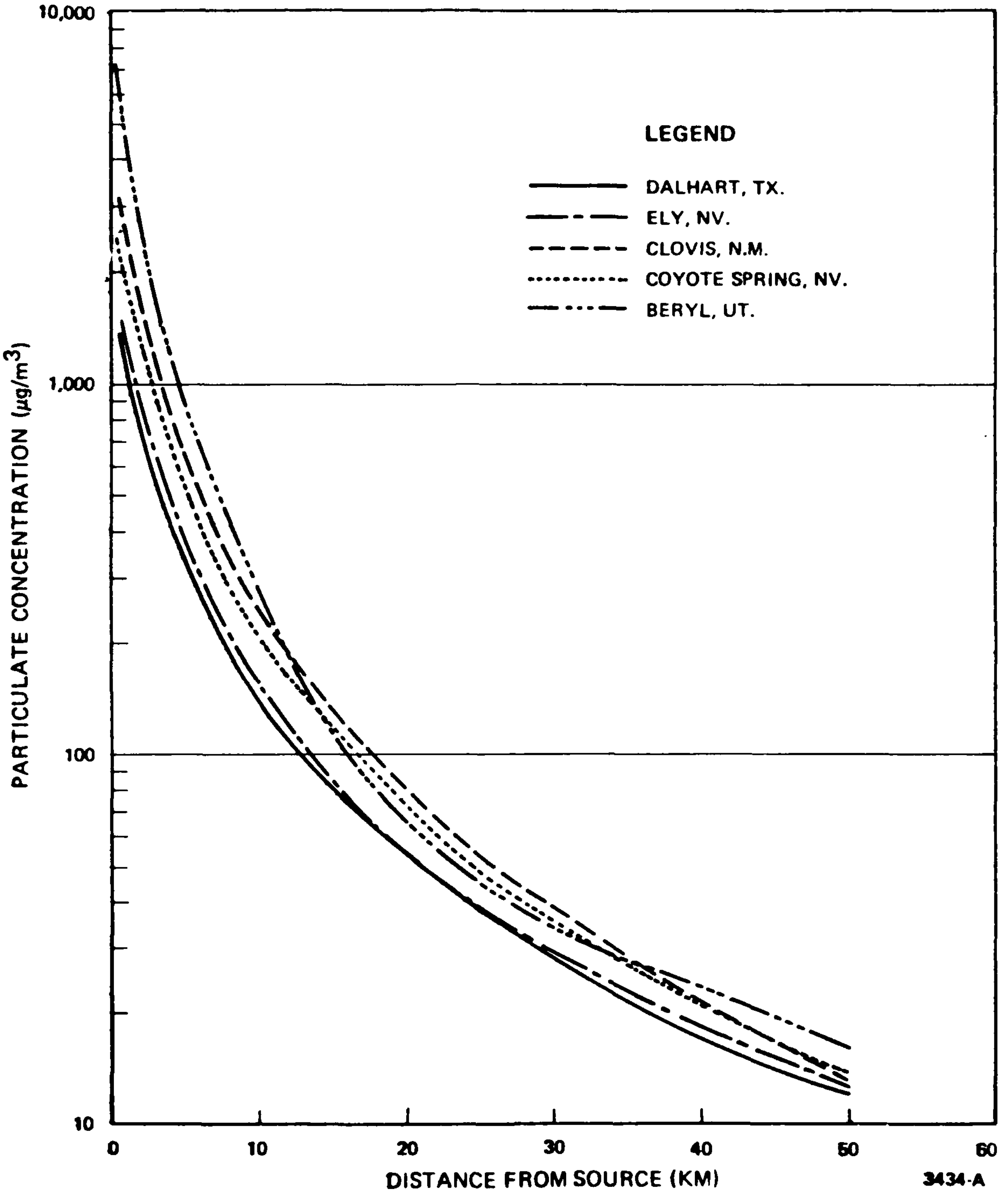


Figure 5.4-4. Predicted hourly particulate concentrations using the ISC model: 60 acres of construction activity with mitigated emissions.

6.0 IMPACT SIGNIFICANCE ANALYSIS

DESCRIPTION OF METHODOLOGY

Air quality impacts were assessed using air quality models that predict pollutant concentrations as a function of meteorological and emissions data that are input into the model. The Point-Area-Line (PAL) and IMPACT models were used to predict particulate concentrations due to fugitive dust emissions from construction activity and wind erosion. The HIWAY model was run to predict gaseous pollutant levels due to vehicular emissions in the construction area and at the operating base during operations. The IMPACT model was also used to predict regional CO and NO_x levels in the operating base vicinity and community due to vehicles and space heating and cooling emissions. It was determined from the modeling results that certain primary disturbances, or M-X associated activities, would result in significant air quality impacts. Significant primary disturbances considered for the short-term were the following: operation of construction support facilities (NO_x), operation of construction support facilities (particulates), construction of clusters and protective structures (particulates), and construction of the primary or secondary operating base (particulates). The following primary disturbances were considered to be significant for the long-term: operation of the system (particulates) and operation of the primary or secondary operating base (particulates and CO).

The severity of impact in a given hydrographic basin depends on the level and type of M-X activity (or primary disturbance) in a basin, as well as any air quality-related features of the basin such as, proposed or existing air pollutant sources and, its geographic relation to any nonattainment areas, Class I areas, or other sensitive receptors. The air quality-related features of the hydrographic basins of the deployment area for the Proposed Action and Alternatives 1 through 6 are shown in Table 6-1.

It was not possible to determine if additional combustion-related air pollutants such as SO_x may cause significant air quality impacts at the operating base during operations since sufficient data was not available on the electrical energy source for the operating base. Also, sufficient data was not available on the magnitude, type, and extent of operating base HC and NO_x emissions in order to determine if any oxidant problem would occur at any of the proposed or alternative operating base sites. Further NO_x emissions from the operators used at the construction camp may cause severe elevated NO_x levels to occur in the camp and vicinity, however, data concerning the generators was not sufficient to quantify the severity of the impact.

6.1 PROPOSED ACTION

The impact significance assigned to each basin for the Proposed Action is shown in Figures 6.1-1 and 6.1-2. The level of impact on air quality during the short-and long-term was assessed as being either no, low, moderate, or high impact. A table summarizing the short- and long-term impacts by hydrographic basin for the DDA of the Proposed Action and Alternatives 1-6 is presented in Table 6.1-1. Existing air quality in the Nevada/Utah area is generally considered excellent with the exception of specifically identified areas such as the Steptoe Valley, Las Vegas Valley, and the Gabbs Valley nonattainment areas. Due to a copper smelter northeast of Ely the Steptoe Valley has been identified by EPA as a nonattainment area for SO_2 and is being considered for redesignation to nonattainment status for

Table 6-1. Summary of air quality resource characteristics for each hydrologic subunit for the deployment areas of the proposed action and the alternatives 1-6 (page 1 of 3).

HYDROLOGICAL UNIT NO.	HYDROLOGICAL UNIT NAME	PROPOSED SOURCES	NONATTAINMENT AREAS	CLASS I AREAS	SENSITIVE RECEPTORS
(4)	Snake	—	None[1]	Within 100mi. of Cedar Breaks	Within 100mi. of Lehman Caves
(5)	Pine	Pine Grove molybdenum mine	None	Within 100mi. of Cedar Breaks, Zion, and Bryce Canyon	Within 30mi. of Lehman Caves
(6)	White	—	None	Within 100mi. of Cedar Breaks	Within 30mi. of Lehman Caves
(7)	Fish Springs	—	None[1]	None	—
(8)	Dugway	—	None[1]	None[1]	—
(9)	Government Creek	—	None[1]	None	—
(46)	Sevier Desert	IPP Power Plant, modular home factory, cement plant	None	Within 100mi. of Cedar Breaks, Zion, and Bryce	Town of Delta nearby
(46A)	Sevier Desert-Dry Lake	—	None	Within 100mi. of Cedar Breaks, Zion, and Bryce Canyon	—
(50)	Milford	Molybdenum Mine, geo-thermal plant	None[2]	Within 40mi. of Cedar Breaks, Zion, and Bryce Canyon	—
(54)	Wah Wah	—	None	Within 100mi. of Cedar Breaks	—
(137A)	Big Smoky-Tonapah Flat	Anaconda molybdenum mine	Near Gabbs Valley (TSP)	Within 100mi. of Death Valley	—
(139)	Kobeh	—	None	None	—
(140A)	Monitor Northern	—	None	None	—
(140B)	Monitor Southern	—	None	None	—
(141)	Ralston	Anaconda Mine	None	Within 100mi. of Death Valley	—
(142)	Alkali Springs	Anaconda Mine	None	Within 100mi. of Death Valley	—
(148)	Cactus Flat	—	None	Within 100mi. of Death Valley	—
(149)	Stony Cabin	—	None	Within 100mi. of Death Valley	—

3726

[1]Nearby Tooele County is nonattainment for SO_2, which is not a significant M-X pollutant.

[2]Nearby Cedar City is nonattainment for SO_2, which is not a significant M-X pollutant.

Table 6-1. Summary of air quality resource characteristics for each hydrologic subunit for the deployment areas of the proposed action and the alternatives 1-6 (page 2 of 3).

HYDROLOGICAL UNIT		PROPOSED SOURCES	NONATTAINMENT AREAS	CLASS I AREAS	SENSITIVE RECEPTORS
NO.	NAME				
(151)	Antelope	—	None	None	—
(154)	Newark	—	None	None	—
(155A)	Northern Little Smoky	—	None	None	—
(155C)	Southern Little Smoky	—	None	None	—
(156)	Hot Creek	—	None	Within 100 mi. of Death Valley	—
(170)	Penoyer	—	None	Within 100 mi. of Death Valley	—
(171)	Coal	—	None	Within 100 mi. of Delta Valley	—
(172)	Garden	—	None	Within 100 mi. of Death Valley	—
(173A)	Southern Railroad	—	None	Within 100 mi. of Death Valley	—
(173B)	Northern Railroad	—	None	Within 100 mi. of Death Valley	Duckwater Indian Reservation
(174)	Jakes	—	Adjacent to Steptoe Valley[3]	None	—
(175)	Long	—	Adjacent to Steptoe Valley[3]	None	—
(178B)	South Butte	—	Adjacent to Steptoe Valley[3]	None	—
(179)	Steptoe[4]	McGill smelter, Kennecott Copper Mine	Entire valley (SO_2) (considered for TSP)	None	—
(180)	Cave	—	Adjacent to Steptoe Valley[3]	None	—
(181)	Dry Lake	—	Near Steptoe Valley[3]	Within 100 mi. of Cedar Breaks and Zion	—
(182)	Delamar	—	None	Within 100 mi. of Cedar Breaks and Zion	—
(183)	Lake	—	Adjacent to Steptoe Valley[3]	Within 100 mi. of Cedar Breaks and Zion	—
(184)	Spring	—	Adjacent to Steptoe Valley[3]	Within 100 mi. of Cedar Breaks and Zion	Within 10 mi. of Lehman Caves

3726

[3]Steptoe Valley is nonattainment for SO_2 and being considered as nonattainment for TSP.

Table 6-1. Summary of air quality resource characteristics for each hydrologic subunit for the deployment areas of the proposed action and the alternatives 1-6 (page 3 of 3).

HYDROLOGICAL UNIT		PROPOSED SOURCES	NONATTAINMENT AREAS	CLASS I AREAS	SENSITIVE RECEPTORS
NO.	NAME				
(196)	Hamlin	—	Near to Steptoe Valley[3]	Within 100 mi. of Cedar Breaks and Zion	Within 10 mi. of Lehman Caves
(202)	Patterson	—	None	Within 100 mi. of Cedar Breaks and Zion	—
(207)	White River	—	Adjacent to Steptoe Valley[3]	None	—
(208)	Pahroc	—	None	None	—
(209)	Pahranagat	—	None	Within 100 mi. of Death Valley and Zion	—
(210)	Coyote Springs	Near to proposed Harry Allen Power Plant	Adjacent to Los Vegas (O_3, TSP, and CO)	Within 100 mi. of Zion	—
(53)	Beryl	—	None	Within 100 mi. of Cedar Breaks and Zion	—

3726

[3]Steptoe Valley is nonattainment for SO_2 and being considered as nonattainment for TSP.

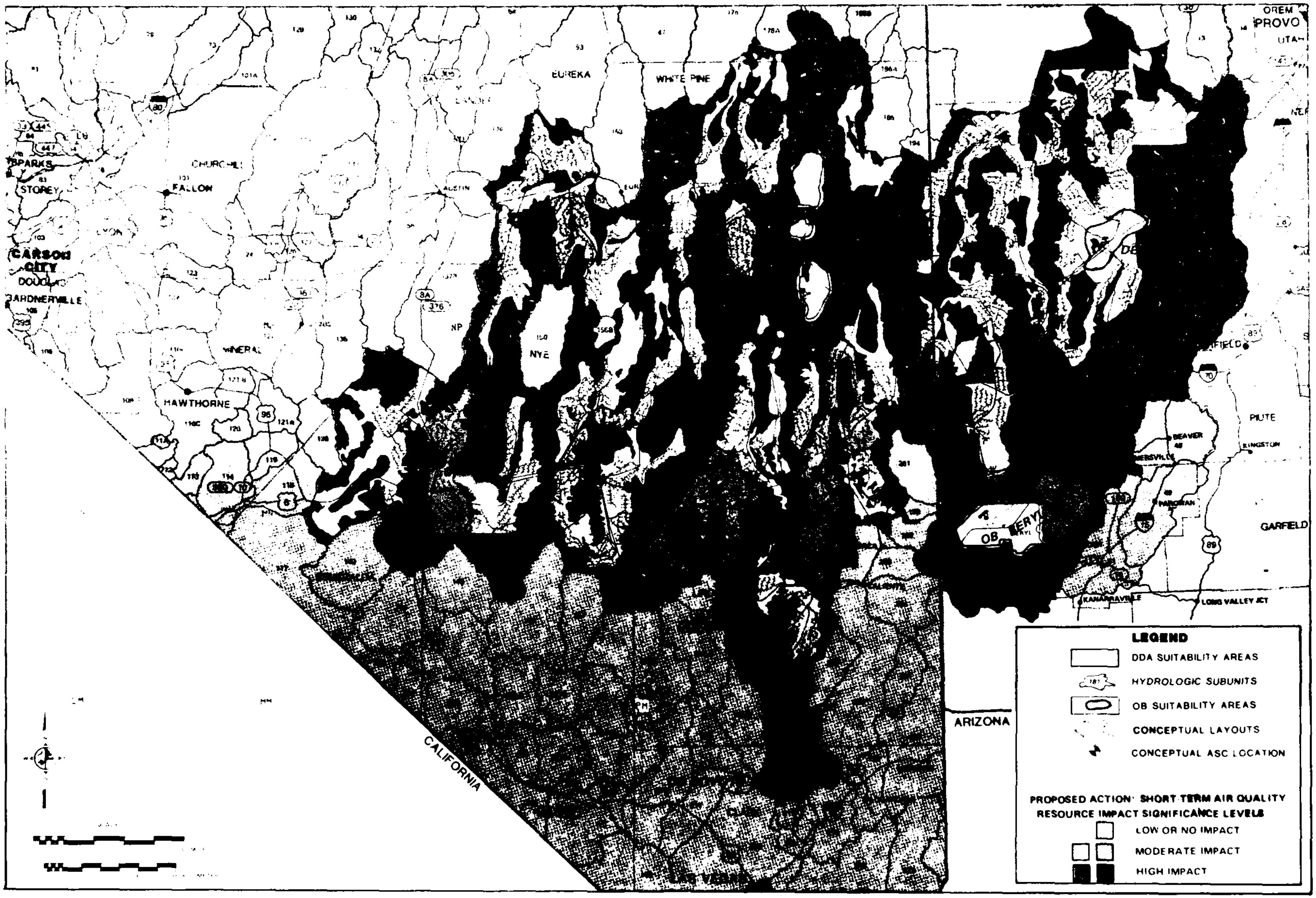


Figure 6.1-1 Proposed Action: Short term air quality resource impact significant levels.

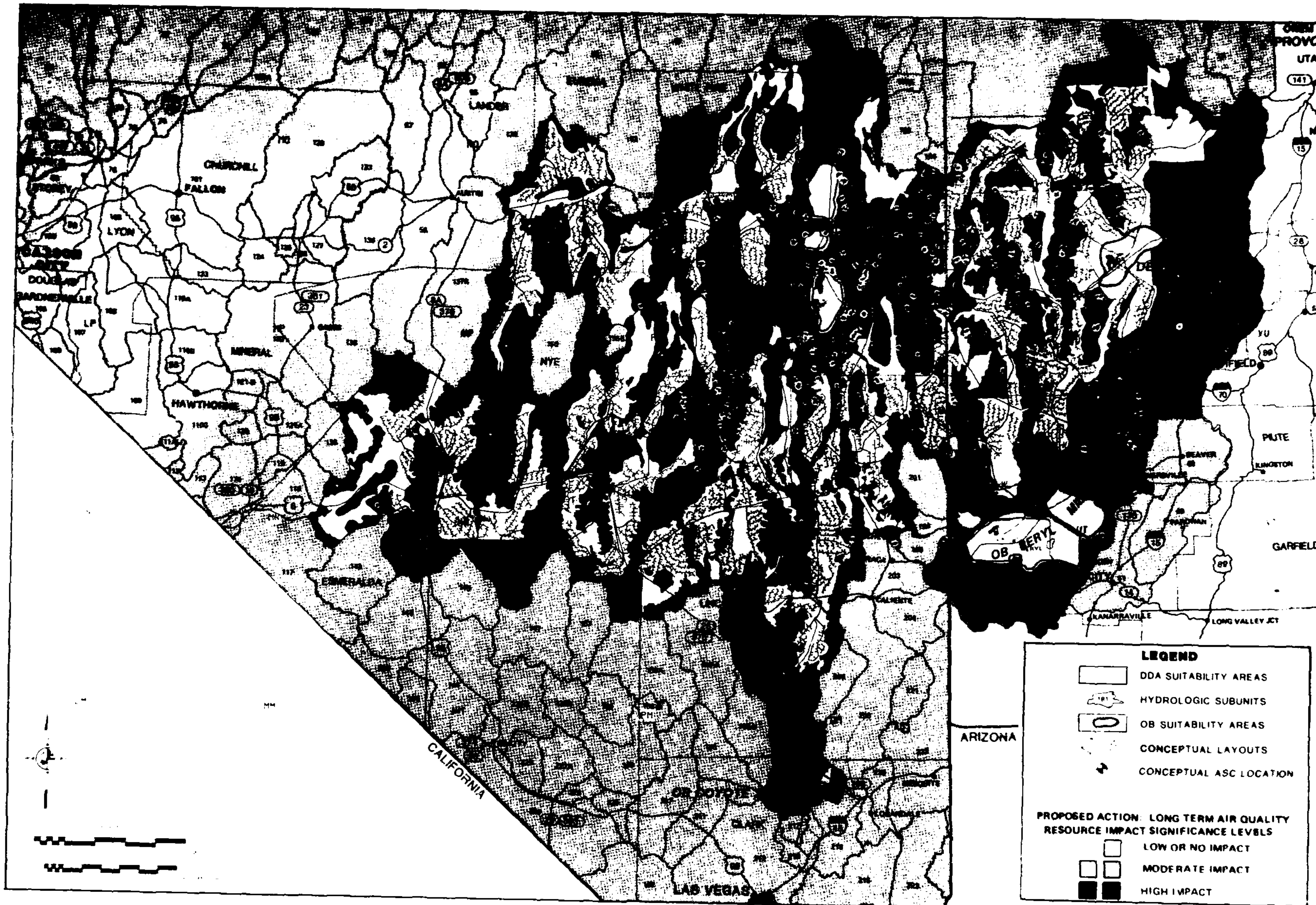


Figure 6.1-2 Proposed Action: Long term air quality resource impact significant levels.

Table 6.1-1. Potential direct impact to air quality in Nevada/Utah DDA for the proposed action and for alternatives 1-6.

HYDROLOGIC SUBUNIT NO.	HYDROLOGIC SUBUNIT NAME	SHORT-TERM IMPACTS[1]	LONG-TERM IMPACTS[1]
4	Snake	Moderate	Low
5	Pine	Moderate	Moderate
6	White	Moderate	Low
7	Fish Springs	Moderate	Moderate
8	Dugway	Moderate	Low
9	Government Creek	Moderate	Low
46	Sevier Desert[2]	Moderate	Low
46A	Sevier Desert & Dry Lake[2]	Moderate	Low
54	Wah Wah	High	Moderate
137A	Big Smokey-Tonopah Flat	Moderate	Low
139	Kobeh	Moderate	Moderate
140A	Monitor—Northern	Moderate	Low
140B	Monitor—Southern	Moderate	Low
141	Ralston	High	Moderate
142	Alkali Spring	High	Moderate
148	Cactus Flat	Low	No impact
149	Stone Cabin	Moderate	Low
151	Antelope	High	Moderate
154	Newark[2]	Moderate	Low
155A	Little Smoky—Northern	Moderate	Low
155C	Little Smoky—Southern	Moderate	Low
156	Hot Creek	Moderate	Moderate
170	Penoyer	High	Moderate
171	Coal	High	Moderate
172	Garden	High	Moderate
173A	Railroad—Southern	Moderate	Low
173B	Railroad—Northern	Moderate	Low
174	Jakes	High	Moderate
175	Long	Moderate	Low
178B	Butte—South	Moderate	Low
179	Steptoe	Low	No impact
180	Cave	Moderate	Moderate
181	Dry Lake[2]	High	Moderate
182	Delamar	Moderate	Moderate
183	Lake	High	Moderate
184	Spring	Moderate	Low
196	Hamlin	High	Moderate
202	Patterson	Moderate	Low
207	White River[2]	Moderate	Low
208	Pahroc	Low	No impact
209	Pahranagat	Moderate	Low
	DDA Overall	High	Moderate

3895-1

[1] No impact.

Low impact. (A basin with a low level of construction activity, no major pollutant sources, no construction camp, and not within a significant distance of Class I or non-attainment areas.)

Moderate impact. (A moderate level of construction activity, or pollutant sources within a significant distance of Class I or nonattainment areas.)

High impact. (A high level of construction activity, and/or a construction camp within a significant distance of Class I nonattainment areas, or major pollutant sources.)

[2] Conceptual location of Area Support Centers (ASCs).

TSP. The deployment area is characterized by complex terrain features. Locally poor dispersion conditions frequently occur during evening and early morning hours due to low inversion levels. The meteorological and terrain conditions tend to localize and increase air quality impacts for the periods when such conditions occur.

Significant air quality impacts will occur due to particulate emissions from M-X construction activity in Nevada/Utah. Under modeled conditions within the valleys increased 24-hour particulate levels could occur as high as 160 ug/m^3 averaged over a 4 km square grid cell (the cell size used for modeling) due to construction of the DTN, cluster roads, and protective structures. Even greater particulate level increases that exceed state and federal air quality standards will result in localized construction areas. Therefore, basins with very dense M-X system activities were designated high impact in the short-term due to elevated dust levels predicted. Related effects generally are short-term visibility impacts, long-range transport effects that could extend short-term visibility impacts to the scenic vistas of Cedar Breaks National Park, Zion National Park, Bryce Canyon, Lake Mead National Recreation Area, Great Basin National Park (proposed), or the Lehman Caves National Monument Area. This is reflected in the analysis by impact significance levels of moderate to high impact in M-X basins within 40 to 100 mi of designated scenic areas. Temporarily increased dust levels will also occur at Duckwater Indian Reservation under certain wind and stability conditions. In addition, these areas would be potentially affected by increased dust from disturbed and exposed soil surfaces remaining after construction. Also, health problems may result from inhaled fugitive dust emissions in areas where zeolites, a suspected carcinogen, occur in the soil. Distribution of zeolites in the Great Basin soils is discussed under Mining and Geology (see Mining and Geology Technical Report).

It is difficult to quantify air quality constraints which may be imposed on future development opportunities as a result of M-X induced effects. The most significant area of potential constraint is the depletion of allowable PSD increment, but for this issue, not only is it difficult to quantify the extent of depletion, it is also unclear as to whether or not the federal regulations apply. As written in the Federal Register, the PSD increments are consumed in general as a result of emissions from new major stationary sources or modifications to such sources. The M-X related emissions are not from stationary sources but from area sources such as disturbed land surfaces and increased vehicular traffic over unpaved roads.

The TSP increment applicable to identified areas may be depleted in part by the overall effect of increased wind erosion from the new roads built during system construction and other exposed surfaces not revegetated, but determination of the amount or even the applicability of regulatory controls to such an increase will require regulatory decisions.

The level of impact assigned to the hydrographic basins with operating bases is given in Table 6.1-2. The hydrographic basins with operating bases were considered high impact areas during the short-term due to the high level of construction activity, causing elevated particulate levels. During the long-term, elevated CO and particulate levels will cause moderate impact in the operating base vicinity.

MILFORD OPERATING BASE SITE

The Milford operating base is in the hydrologic subunit 50. The base is within 100 mi of Zion and Bryce Canyon Class I areas and the Cedar Breaks proposed

Table 6.1-2. Potential impact to air quality at operating bases.

HYDROLOGIC SUBUNIT		BERYL, UTAH (ALT. 1,3, & 4)		COYOTE SPRING, NEVADA (P.A. & ALT. 1, 2, 4, 6, & 8)		DELTA, UTAH (ALT. 2)	
NO.	NAME	SHORT-TERM IMPACTS[1]	LONG-TERM IMPACTS[1]	SHORT-TERM IMPACTS[1]	LONG-TERM IMPACTS[1]	SHORT-TERM IMPACTS[1]	LONG-TERM IMPACTS[1]
46	Sevier Desert					High	Moderate
46A	Sevier Desert-Dry Lake[2]					Moderate	Moderate
50	Milford[2]						
52	Lund District	Moderate	Moderate				
53	Beryl-Enterprise District	High	Moderate				
179	Steptoe						
210	Coyote Spring			High	Moderate		
219	Muddy River Springs			Moderate	Moderate		
	Overall OB	High	Moderate	High	High	High	Moderate

HYDROLOGIC SUBUNIT		ELY, NEVADA (ALT. 3 & 5)		MILFORD, UTAH (P.A. & ALT. 1, 5 & 6)	
NO.	NAME	SHORT-TERM IMPACTS[1]	LONG-TERM IMPACTS[1]	SHORT-TERM IMPACTS[1]	LONG-TERM IMPACTS[1]
46	Sevier Desert[2]				
46A	Sevier Desert-Dry Lake[2]				
50	Milford[2]			High	High
52	Lund District			Moderate	Moderate
53	Beryl-Enterprise District				
179	Steptoe	High	Moderate		
210	Coyote Spring				
219	Muddy River Springs				
	Overall OB	High	Moderate	High	Moderate

3899-4

- None.
- Low.
- Moderate.
- High.

Note: Hydrographic basins with operating bases were considered high air quality impact areas during the short-term due to the high level of construction activity, causing elevated particulate levels. During the long-term, elevated CO and particulate levels could cause moderate impact in the operating base vicinity.

[2]Conceptual location of Area Support Centers (ASCs)

Class I area. Also, the Milford OB airfield is approximately 40 mi from the Cedar Breaks proposed Class I area. Elevated particulate levels due to fugitive dust caused by construction of the operating base or increased SO_x, NO_x, or oxidant levels during operation of the operating base may affect visibility at these Class I areas. However, sufficient data is not available concerning construction and operation of the operating base in order to determine if these possible impacts will be significant. Operation base community vehicular traffic will cause elevated CO concentrations to occur in the immediate vicinity of the operating base and the support community.

COYOTE SPRING OPERATING BASE SITE

The Coyote Spring operating base site; located in hydrologic subunit 210, is not within 100 mi of any Class I areas. It is within 20 mi of an existing power plant, the Reid Gardner Plant, and a proposed power plant, the Harry Allen Plant. Since the energy source for the operating base is uncertain, the potential cumulative air quality impact of these two power plants and the Coyote Spring OB site is unknown. The Coyote Spring hydrologic subunit is adjacent to Las Vegas Valley, designated as a nonattainment area for TSP, O_3, and CO. During construction of the operating base, fugitive dust from construction may aggravate the particulate problem in Las Vegas Valley. During operation, CO, HC, NO_x, and O_3, will increase at the operating base site and will increase to some degree at Las Vegas Valley due to population growth as a result of the M-X system.

The influx of M-X related people into the area would use a portion of allowable emissions offsets as outlined in the Las Vegas Valley Air Quality Implementation Plan. Depleting the offset allotment would make acquisition of such by another project more difficult. These considerations caused the hydrographic basin with the Coyote Spring operating base (Basin No. 210) to be designated high impact for the long-term.

6.2 ALTERNATIVE 1

The location of the secondary operating base is the only difference between the Proposed Action and Alternative 1. See Figures 6.1-1 and -2 and Table 6.1-1 for the impact significance of the DDA and Table 6.1-2 for the impact significance of the primary and secondary operating base. The secondary OB site for Alternative 1 is at Beryl, Utah, located in hydrographic basin 53, rather than in basin 50 as in the Proposed Action. All impact significance values assigned to the remaining basins do not change because the configuration of clusters and roadways is identical under both alternatives. Impacts within hydrographic basin 53 are significant for Alternative 1, during both short- and long-term periods. Impacts in hydrographic basin 50 changes to a no impact level for Alternative 1. The Beryl, Utah, OB site is within 100 mi of the Cedar Breaks proposed Class I area and Zion National Park, an existing Class I area. It is not near any areas designated nonattainment for pollutants significant to the M-X system impacts.

6.3 ALTERNATIVE 2

The location of the secondary operating base is the only difference between the Proposed Action and Alternative 2. See Figures 6.1-1 and 6.1-2 and Table 6.1-1 for the impact significance of the DDA, Table 6.1-2 for the impact significance of the secondary operating base. The secondary OB site for Alternative 2 is at Delta, Utah, located in hydrographic basin 46, rather than in basin 50 as in the

Proposed Action. All the impact significance values assigned to the remaining basins do not change because the configuration of clusters and roadways is identical under both alternatives. For Alternative 2 hydrographic basin 46 is ranked 5 during the short-term period and a 4 during the long-term period. Hydrographic basin 50 changes to a no impact level. The Delta, Utah, OB site is greater than 100 mi from the Cedar Breaks proposed Class I area and Zion National Park, existing Class I area. It is not near any areas designated nonattainment for a pollutant considered significant to the M-X system.

6.4 ALTERNATIVE 3

The configuration of the M-X system in the deployment area is identical for Alternative 3 as for the Proposed Action. Therefore, impact significance assigned to all hydrographic basins in the deployment area are the same for Alternative 3 as for the Proposed Action, with the exception of those basins with the primary and secondary operating base sites. Beryl, Utah, in hydrographic basin 53, is the location of the primary operating base site for Alternative 3. See Figures 6.1-1 and -2 and Table 6.1-1 for the impact significance of the DDA and Table 6.1-2 for the impact significance of the Ely operating base. The secondary operating base site is at Ely, Nevada, located in hydrographic basin 179. These basins are assigned the high impact significance level for the short-term period and a moderate level for the long-term period. Short-term problems concern elevated particulate levels caused by particulate emissions from construction of the operating base. CO emissions from vehicles will cause elevated CO concentrations in areas adjacent to high density vehicular traffic in the operating bases and support communities. This will be a long-term impact.

Impact significance for the Beryl, Utah, primary operating base will be nearly identical to those described under Alternative 1 for the secondary base configuration. Differences were considered to be undetectable at the level of this analysis.

6.5 ALTERNATIVE 4

The significance of air quality impacts on air resources in Nevada and Utah due to the M-X system for Alternative 4 are nearly identical to those described for Alternative 1. Differences were considered insignificant for purposes of this analysis.

6.6 ALTERNATIVE 5

The impact significance for Alternative 5 are the same for the DDA as those described in the Proposed Action. The impact of the Milford, Utah primary operating base are nearly identical to those described for the Milford, Utah secondary operating base of the Proposed Action. The impact significance is considered identical at the level of this analysis. The impact significance for the secondary operating base at Ely, Nevada is the same as that described in Alternative 3 for the Ely secondary operating base.

6.7 ALTERNATIVE 6

The significance of air quality impacts on air resources in Nevada and Utah due to the M-X system for Alternative 6 are close to those described for the Proposed Action. Differences were considered insignificant for purposes of this analysis.

6.8 ALTERNATIVE 7

The methodology used to determine impact significance for the Texas/New Mexico region was the same as that discussed for the Nevada/Utah region (see Description of Methodology, Section 6). The county is the geographic unit considered in the Texas/New Mexico region as opposed to the hydrographic basin used in Nevada/Utah basin and range province. For air quality purposes the county does not portray any boundaries to atmospheric processes, however, the county is a useful unit for this analysis as a geographic area defined by a certain density of M-X system activity and having certain baseline environment characteristics.

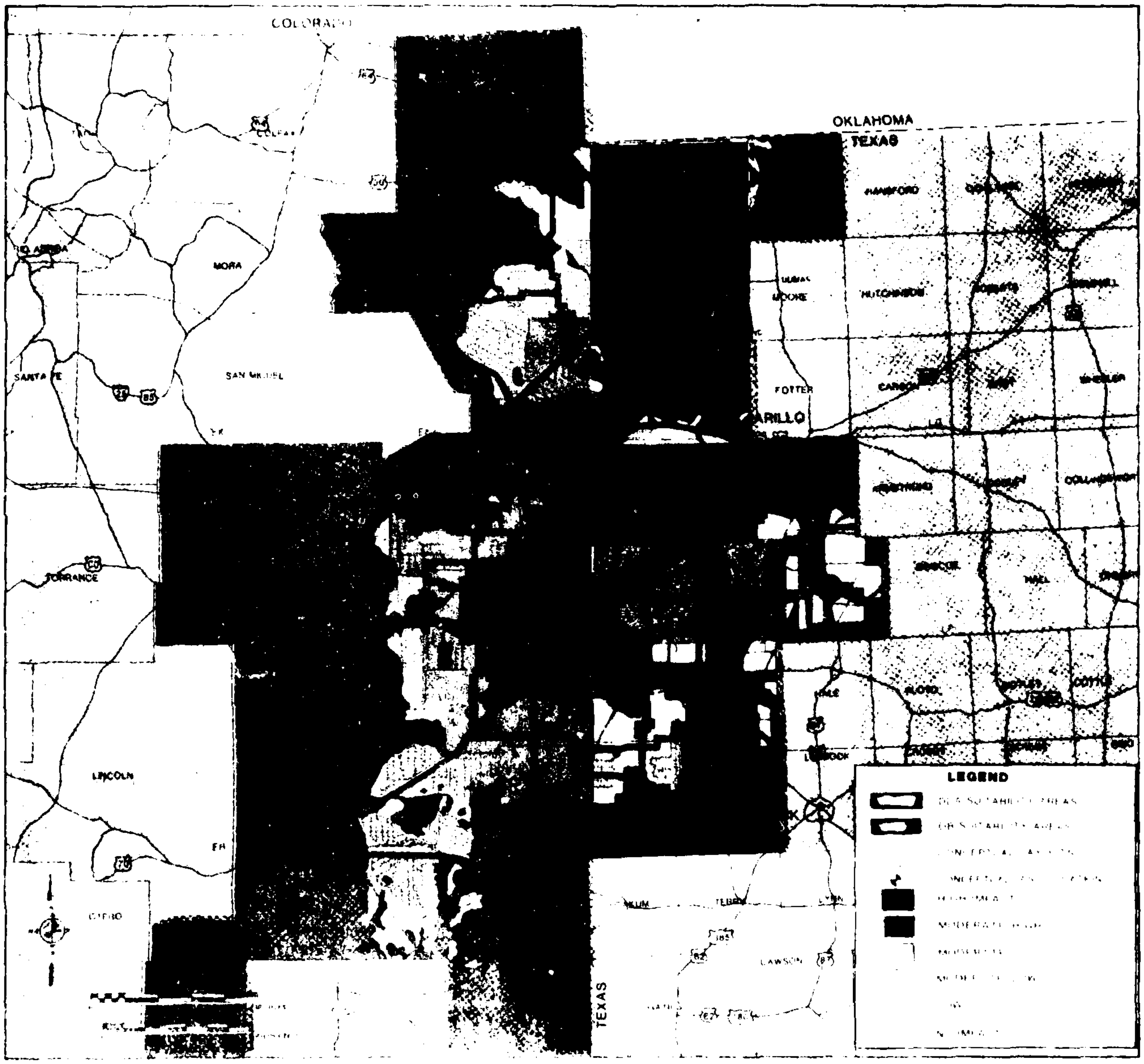
Figures 6.8-1 and 6.8-2 and Table 6.8-1 show the level of air quality impact in counties of the DDA. The type and level of M-X system activity in the county as well as the air quality-related characteristics of the county were considered in assessing the level of potential impact. County-specific features taken into account are shown in Table 6.8-2.

The same air pollution-related primary disturbances were considered in the Texas/New Mexico region as for Nevada/Utah. Fugitive dust emissions will be of primary concern in the deployment area during the short- and long-term. Fugitive dust emissions from construction activity and from the stationary sources that process construction materials at the construction camp will cause excessive localized particulate concentrations. Preliminary evidence indicates that elevated NO_x levels from NO_x emissions due to the generators located at construction camps, however, precise quantification is not possible because of insufficient source data. All counties with one or more construction camps received a moderate to high impact rating for the short-term.

Construction of the operating bases will cause significant localized elevated particulate concentrations, therefore, the counties with operating bases (Curry, New Mexico and Hartley, Texas) were considered to be high impact areas during the short-term. Curry and Hartley counties received long-term moderate impact ratings because of increased CO concentrations expected due to vehicles and space heating and cooling. The particulate nonattainment areas in Eddy County, which is south of and adjacent to Lea County, did not affect ratings for Lea County because of the transport distance and the southerly prevailing winds. M-X system impacts on existing and proposed Class I areas of White Mountain, Pecos, Wheeler Peak, and Capulin Mountain, New Mexico, were reflected in higher ratings assigned to counties within 100 mi of the Class I areas.

6.9 ALTERNATIVE 8

The split basing alternative is identical in level of impact to portions of the Proposed Action and Alternative 7. See Figures 6.9-1 through 6.9-3 and Tables 6.9-1 for the impact significance of the DDA and the operating bases. Impacts described for the Coyote Spring primary operating base site (Proposed Action) and for the Clovis primary operating base site (Alternative 7) were considered to be identical at this level of analysis. Counties and hydrographic basins containing the M-X system were assigned the same level of impact ratings as were previously assigned except when the density of M-X system activity was altered.



... impact significance levels ...
... New Mexico.

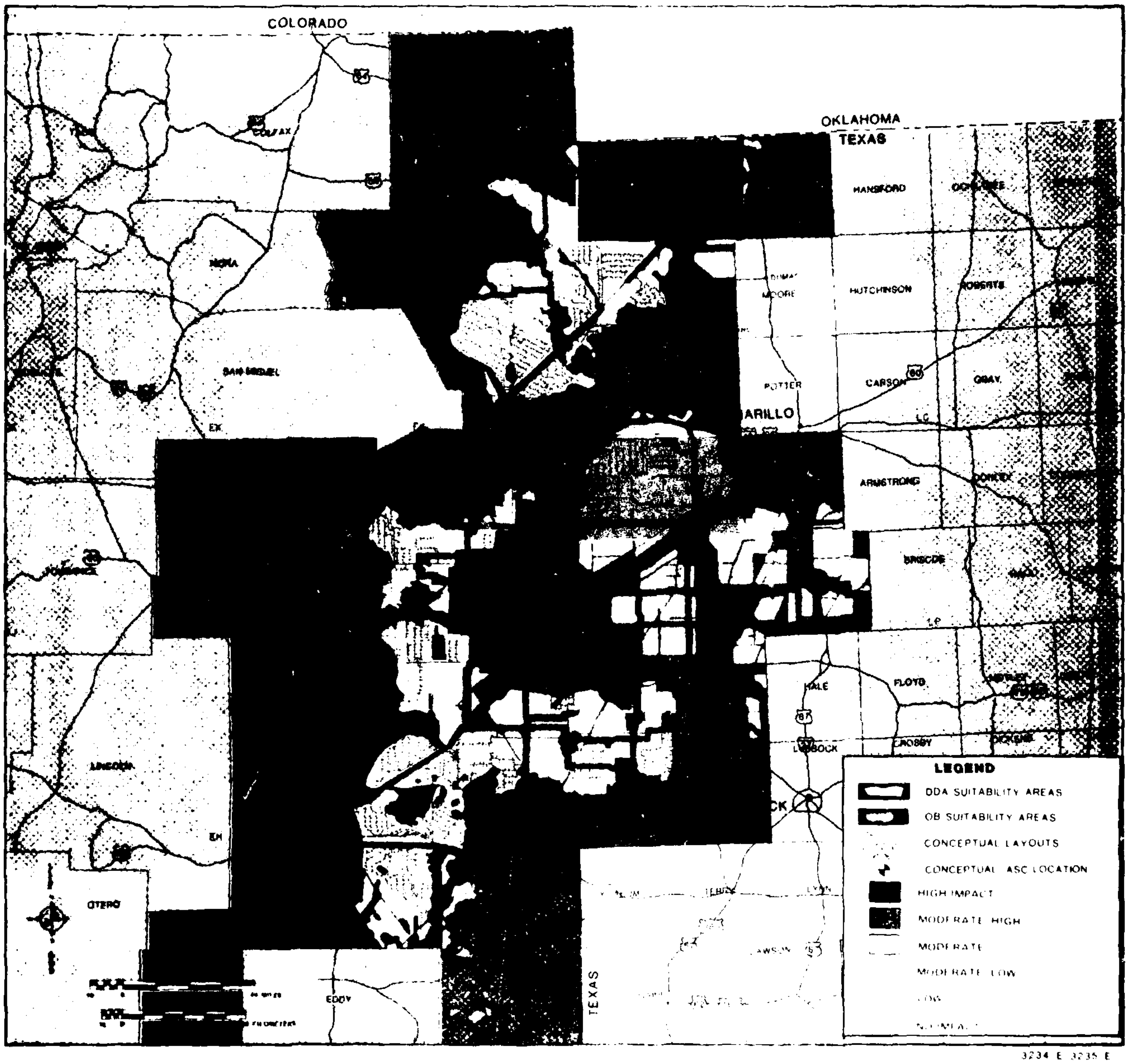


Figure 6.8-2. Long term air quality impact [illegible] levels,
Alternative [illegible], Texas/New [illegible]

Table 6.8-1. Summary of air quality characteristics by county for alternatives 7 and 8.

COUNTY NAME	EXISTING SOURCES	NONATTAINMENT AREAS	CLASS I AREAS	[illegible]
Chaves (NM)	9-TSP, 1-SO_x, 4-NO_x, 3-CO, 4-HC	Adjacent to Eddy Co. (TSP)	Within 100 mi of Carlsbad and White Mountains	Near [illegible] Bitter Lake [illegible] Salt Creek [illegible]
Curry (NM)	3-TSP	None	None	[illegible]
DeBaca (NM)	1-TSP	None	None	—
Harding (NM)	—	None	Within 100 mi of Capulin Mountains	—
Lea (NM)	14-TSP, 11-SO_x, 11-NO_x, 1-CO, 13-HC	None	None	—
Quay (NM)	3-TSP, 1-SO_x, 1-NO_x, 1-CO, 1-HC	None	Within 100 mi of Capulin Mountains	Near [illegible]
Roosevelt (NM)	5-TSP, 1-SO_x, 5-NO_x, 5-CO, 5-HC	None	None	Near [illegible]
Union (NM)	1-TSP, 1-SO_x, 1-NO_x, 1-CO, 1-HC	None	Within 100 mi of Capulin Mountains	[illegible]
Bailey (TX)	7-TSP, 1-CO, 1-HC	None	None	Near [illegible] NWR
Castro (TX)	12-TSP, 1-NO_x, 1-CO, 1-HC	None	None	—
Cochran (TX)	3-TSP, 1-SO_x, 1-NO_x, 1-CO, 1-HC	None	None	-
Dallam (TX)	4-TSP	None	Within 100 mi of Capulin Mountains	Rita Blanca [illegible] Grassland
Deaf Smith (TX)	15-TSP, 2-SO_x, 2-NO_x, 2-CO, 2-HC	None	None	Near town of [illegible]
Hartley (TX)	4-TSP	None	Within 100 mi of Capulin Mountains	Near town of [illegible]
Hockley (TX)	6-TSP, 2-SO_x, 2-NO_x, 2-CO, 3-HC	None	None	Near town of [illegible]
Lamb (TX)	19-TSP, 2-SO_x, 2-NO_x, 2-CO, 2-HC	None	None	Near town of [illegible]
Oldham (TX)	5-TSP	None	None	—
Parmer (TX)	16-TSP, 1-NO_x, 1-CO, 1-HC	None	None	—
Randall (TX)	4-TSP	None	None	Near [illegible] Amarillo [illegible] and near [illegible] Lake NWR
Sherman (TX)	5-TSP	None	None	—
Swisher (TX)	16-TSP, 1-NO_x, 1-HC	None	None	Near town of [illegible]

Table 6.8-2. Direct impact to air quality in the Texas/New Mexico DDA for Alternative 7.

COUNTY	SHORT-TERM IMPACTS[1]	LONG-TERM IMPACTS[1]
Counties with M-X clusters and DTN		
Bailey, TX	Moderate	Moderate
Castro, TX	High	Moderate
Cochran, TX	Moderate	Moderate
Dallam, TX	High	Moderate
Deaf Smith, TX	High	Moderate
Hartley, TX	High	Moderate
Hockley, TX	Moderate	Low
Lamb, TX	Moderate	Low
Oldham, TX	Moderate	Low
Parmer, TX	High	Moderate
Randall, TX	Moderate	Moderate
Sherman, TX	Moderate	Low
Swisher, TX	Moderate	Low
Chaves, NM	Moderate	Moderate
Curry, NM	High	Moderate
DeBaca, NM	Moderate	Low
Guadalupe, NM	Low	No impact
Harding, NM	Moderate	Moderate
Lea, NM	Moderate	Low
Quay, NM	High	Moderate
Roosevelt, NM	High	Moderate
Union, NM	Moderate	Low
Overall DDA	High	Moderate

3952-3

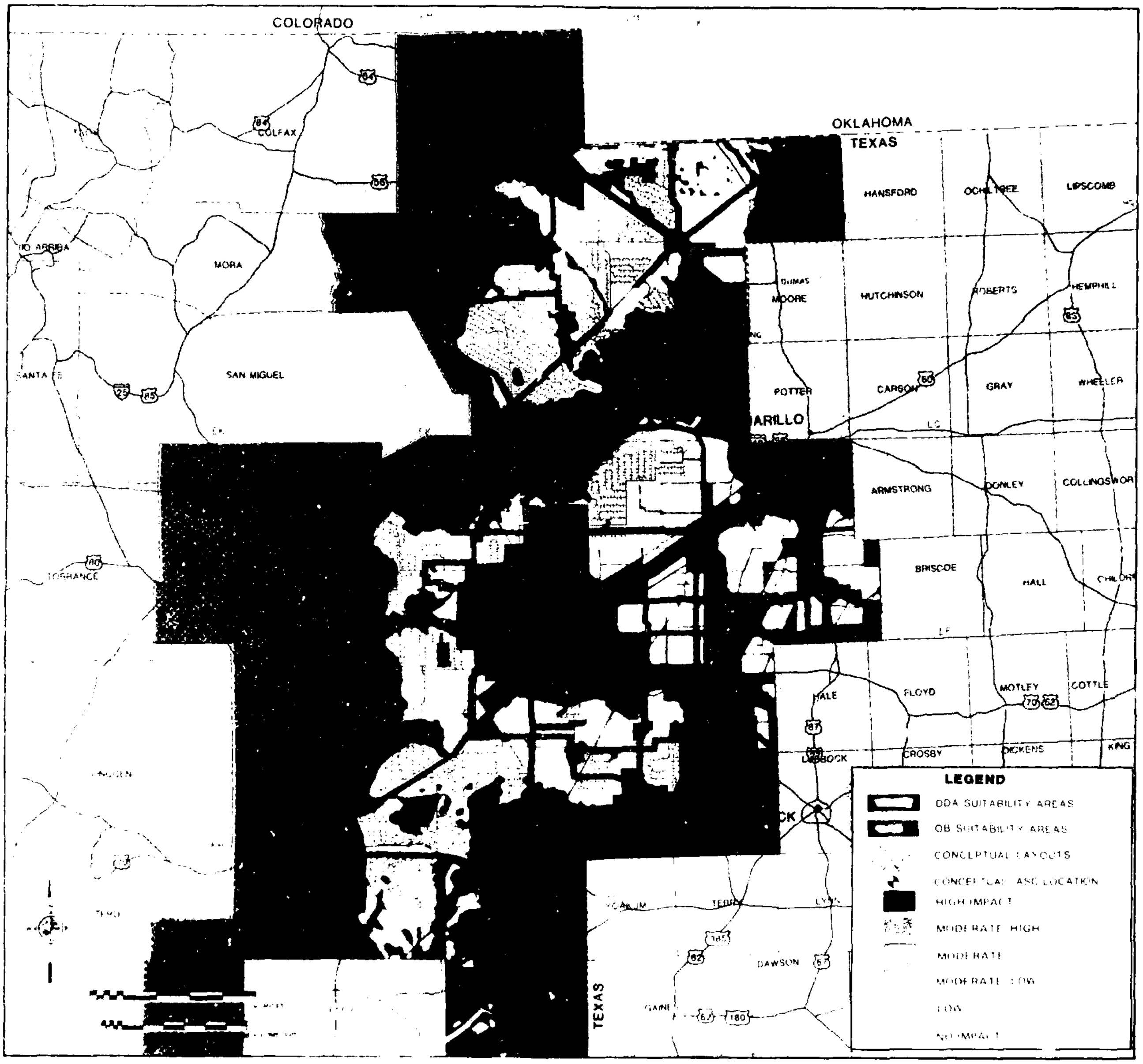
[1] = No impact.

= Low impact. (A county with a low level of construction activity, no major pollutant sources, no construction camp, and not within a significant distance of Class I or nonattainment areas.)

= Moderate impact. (A moderate level of construction activity, or pollutant sources within a significant distance of Class I or nonattainment areas.)

= High impact. (A high level of construction activity, and/or a construction camp within a significant distance of Class I nonattainment areas, or major pollutant sources.)

[2]Conceptual location of Area Support Centers (ASCs)



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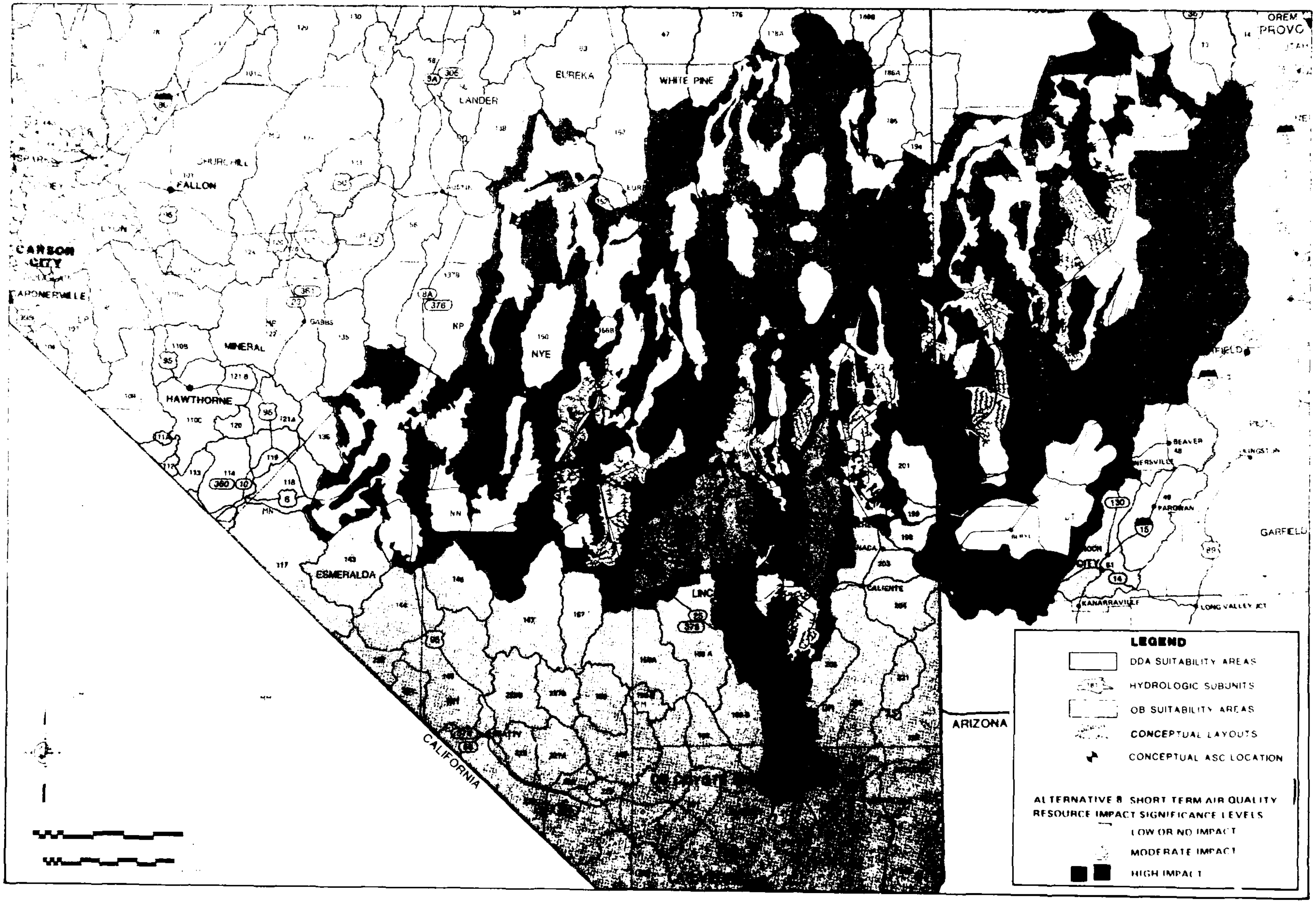

Figure 6.9-2. Alternative 8: Short-term air quality resource impact significant levels.

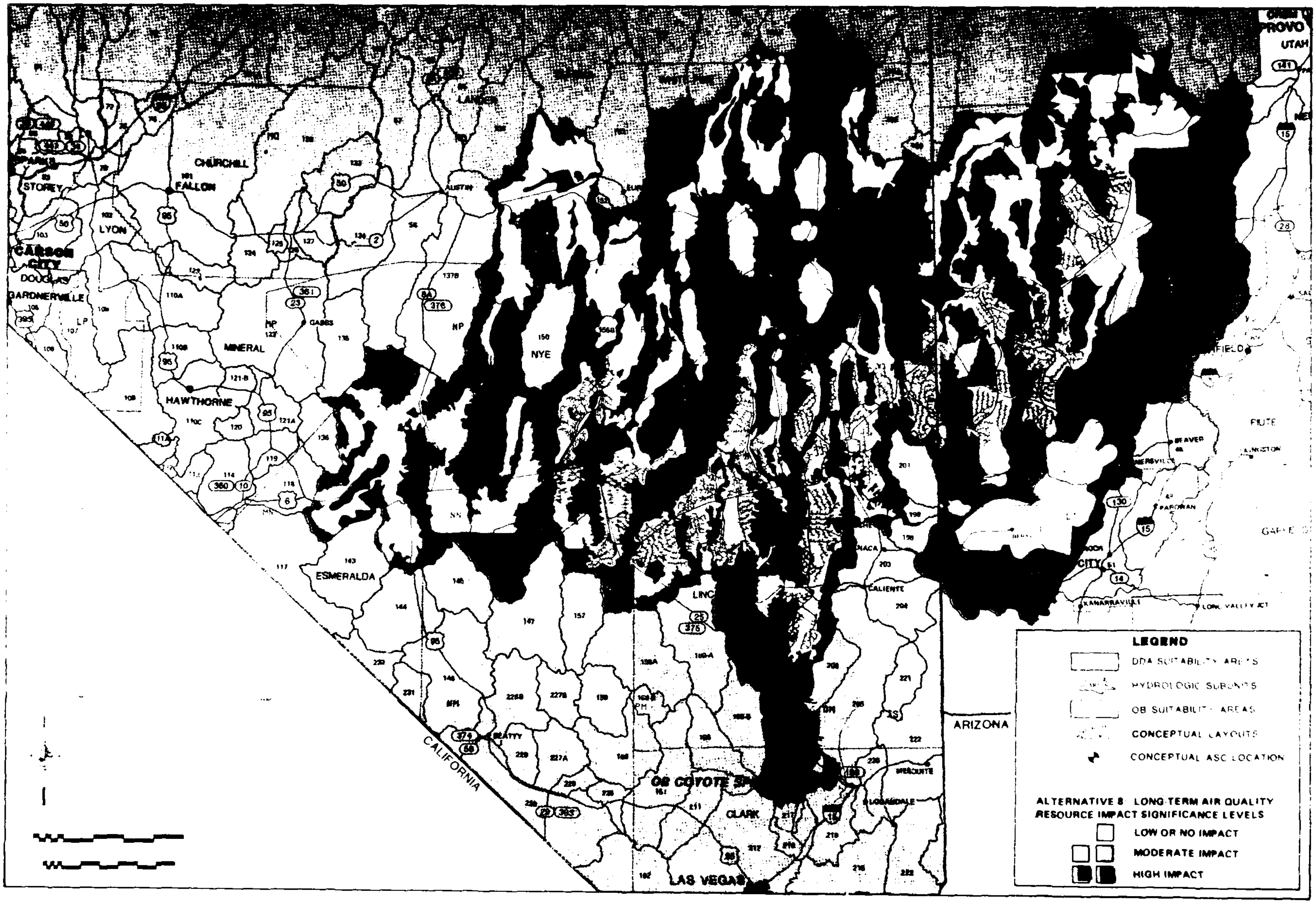

Figure 6.9-3. Alternative 8: Long-term air quality resource impact significant levels.

Table 6.9-1. Direct [illegible] the Nevada/Ut[illegible] Mexico DDAs for alt[illegible]

HYDROLOGIC SUBUNIT OR COUNTY		[illegible]	[illegible]
NO	NAME		
Subunits or counties with M-X [illegible]			
4	Snake		
5	Pine		
6	White		
7	Fish Springs		
46	Sevier Desert		
46A	Sevier Desert & Dry Lake[2]		
54	Wah Wah		
155C	Little Smoky--Southern		
156	Hot Creek		
170	Penoyer		
171	Coal		
172	Garden		
173AB	Railroad N&S		
180	Cave		
181	Dry Lake[3]		
182	Delamar		
183	Lake		
184	Spring		
196	Hamlin		
202	Patterson		
207	White River		
210	Coyote Spring[2]		
	Bailey, TX		
	Castro, TX		
	Cochran, TX		
	Dallam, TX		
	Deaf Smith, TX		
	Hartley, TX[3]		
	Hockley, TX		
	Lamb, TX		
	Oldham, TX		
	Parmer, TX		
	Randall, TX		
	Sherman, TX		
	Swisher, TX		
	Chaves, NM		
	Curry, NM		
	DeBaca, NM		
	Harding, NM		
	Lea, NM		
	Quay, NM		
	Roosevelt, NM[3]		
	Union, NM		
	Overall DDA Impact		

3951-3

= No impact.* = Moderate impact.*

= Low impact.* = High impact.*

*See Table 4.3.1.3-2 for [illegible] impact levels.

[2]Does not contain M-X clusters or [illegible]

[3]Conceptual location of Area [illegible]

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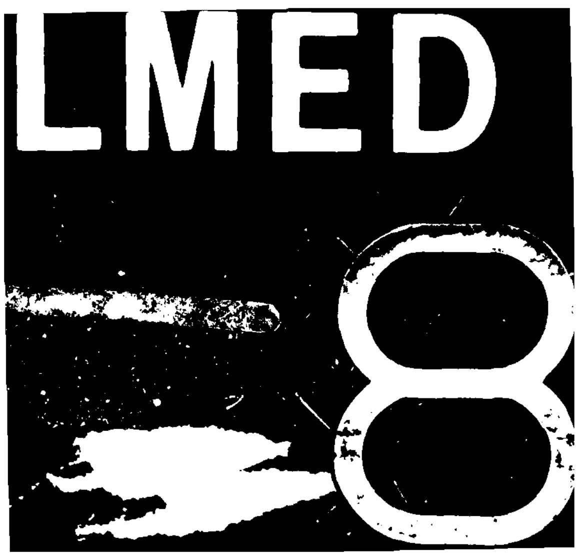
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